KENDRIYA VIDYALAYA DRDO BENGALURU
WINTER BREAK HOLIDAY HOMEWORK
CLASS – 6TH SUBJECT – MATHEMATICS

INSTRUCTIONS :

1)HOME WORK OF THE 3 CHAPTERS TO BE DONE NEATLY ,IN HOLIDAY HOME WORK NOTEBOOK .
2) LEARNER'S DIARY (IF NOT YET DONE) TO BE DONE IN HHW NOTEBOOK.
3) MDP TO BE DONE IN A4 SHEET PAPERS .

1. Using tally marks, which one of the following represents the number eight:
(A)|||| (B)𝍸 ||| (C) ||| (D) 𝍸|

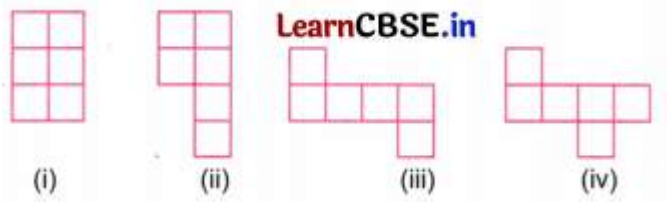
2. The marks (out of 10) obtained by 28 students in a Mathematics test are listed as below: 8, 1, 2, 6, 5, 5, 5, 0, 1, 9, 7, 8, 0, 5, 8, 3, 0, 8, 10, 10, 3, 4, 8, 7, 8, 9, 2, 0 The number of students who obtained marks more than or equal to 5 is
(A) 13 (B) 15 (C) 16 (D) 17

3. In question 2 above, the number of students who scored marks less than 4 is
(A) 15 (B) 13 (C) 12 (D) 10

4. The choices of the fruits of 42 students in a class are as follows: A , O , B , M , A , G , B , G , A , G , B , M , A , G , M , A , B , G , M , B , A , O , M , O , G , B , O , M , G , A , A , B , M , O , M , G , B , A , M , O , M , O, 11.4.2018 11.4.2018 DATA HANDLING 73 MATHEMATICS where A, B, G, M and O stand for the fruits Apple, Banana, Grapes, Mango and Orange respectively. Which two fruits are liked by an equal number of students?
(A) A and M (B) M and B (C) B and O (D) B and G

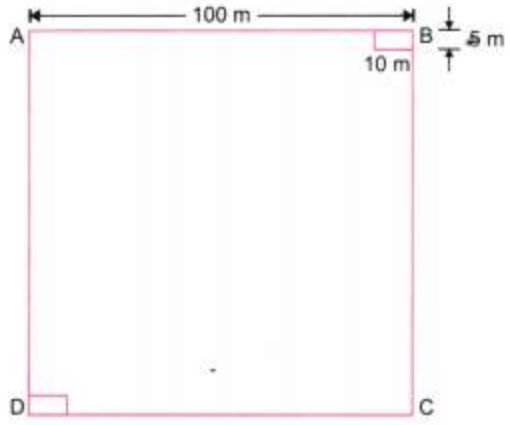
5. According to data of question 4, which fruit is liked by most of the students?
(A) O (B) G (C) M (D) A

6. Following figures are formed by joining six unit squares. Which figure has smallest perimeter?



(A) (ii) (B) (iii) (C) (iv) (D) (i)

7. A square shaped park ABCD of side 100 m has two equal rectangular flower beds each of size 10m* 5 m (see figure). Length of the boundary of the remaining park is



(A) (ii) (B) (iii) (C) (iv) (D) (i)

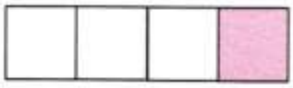
8. Perimeter of a square =
(A) 4 × Length of a side (B) 2 × Length of a side (C) 3 × Length of a side (D) 6 × Length of a side.

9. Perimeter of a square =
(A) 2 × Length of a side (B) 3 × Length of a side (C) 4 × Length of a side (D) 6 × Length of a side.

10. Perimeter of an equilateral triangle =
(A) 2 × Length of a side (B) 3 × Length of a side (C) 4 × Length of a side (D) 6 × Length of a side.

11. The perimeter of a rectangular piece of cardboard is 6 m. Its breadth is 1 m. Find its length.
(A) 1 m (B) 2 m (C) 3 m (D) 6 m

11. The fraction representing the shaded portion is



(A) $\frac{1}{4}$ (B) $\frac{3}{4}$ (C) $\frac{1}{2}$ (D) $\frac{1}{8}$

12. The fraction representing the shaded portion is

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{1}{6}$ (D) none of these

13. The fraction representing the shaded portion is

(A)) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{1}{3}$ (D) $\frac{1}{8}$

14. The equivalent fraction of $\frac{2}{5}$ numerator 4 is 2
(A) $\frac{4}{10}$ (B) $\frac{4}{12}$ (C) $\frac{4}{16}$ (D) $\frac{4}{20}$

15. Which of the following is a proper fraction whose numerator is 1 and denominator is 3?
(A) $\frac{1}{3}$ (B) $\frac{1}{6}$ (C) $\frac{1}{9}$ (D) $\frac{1}{12}$

16. Thirty students were interviewed to find out what they want to be in future. Their responses are listed as below: doctor, engineer, doctor, pilot, officer, doctor, engineer, doctor, pilot, officer, pilot, engineer, officer, pilot, doctor, engineer, pilot, officer, doctor, officer, doctor, pilot, engineer, doctor, pilot, officer, doctor, pilot, doctor, engineer Arrange the data in a table using tally marks

17. Following are the choices of games of 40 students of Class VI: football, cricket, football, kho-kho, hockey, cricket, hockey, kho-kho, tennis, tennis, cricket, football, football, hockey, kho-kho, football, cricket, tennis, football, hockey, kho-kho, football, cricket, cricket, football, hockey, kho-kho, tennis, football, hockey, cricket, football, hockey, cricket, football, kho-kho, football, cricket, hockey, football.

(A) Arrange the choices of games in a table using tally marks.
(B) Which game is liked by most of the students?
(C) Which game is liked by minimum number of students?

18. The number of bottles of cold drinks sold by a shopkeeper on six consecutive days is as follows:

DAY	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
NUMBER OF BOTTLE	350	300	200	250	100	150

Prepare a pictograph of the data using one symbol to represent 50 bottles

19. The following table gives information about the circulation of newspapers (dailies) in a town in five languages. Prepare a pictograph of the above data, using a symbol of your choice, each representing 1000 newspapers

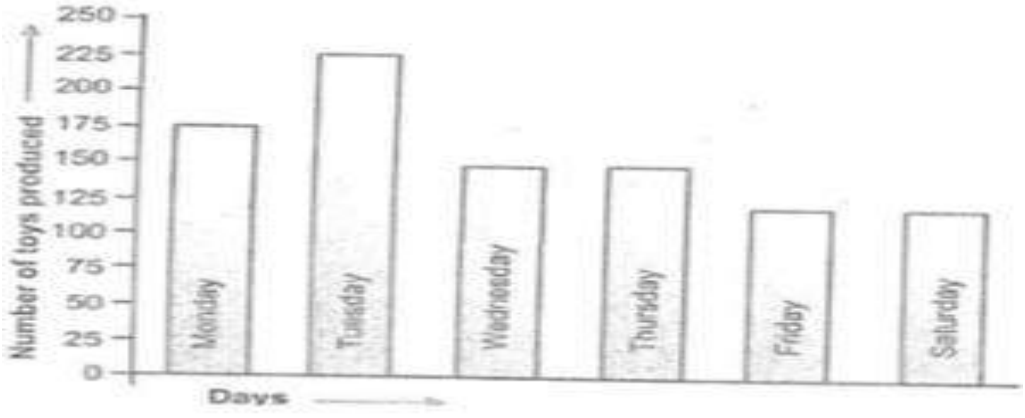
LANGUAGE	ENGLISH	HINDI	TAMIL	GUJRATI	PUNJABI	
NUMBER OF NEWSPAPER	5000	8500	500	1000	1200	

20. The lengths in km (rounded to nearest hundred) of some major rivers of India is given below

RIVER	LENGTH(IN KM)
NARMADA	1300
MAHANADI	900
BRAHMAPUTRA	2900
GANGA	2500
KAVERI	800
KRISHNA	1300

Draw a bar graph to represent the above information.

21. The bar graph shows the number of toys produced by a factory during a certain week:



Answer the following questions:

a. On which day the maximum number of toys were produced?
b. On which day equal number of toys were produced?
c. What is the total number of toys produced during the week?
d. In which day minimum number of toys were produced?

22. The lid of a rectangular box of sides 40 cm by 10 cm is sealed all round with tape. What is the length of the tape required?

23. Find the perimeter of each of the following shapes:

(A) A triangle of sides 3 cm, 4 cm and 5 cm

(B) An equilateral triangle of side 9 cm

(C) An isosceles triangle with equal sides 8 cm each and third side 6 cm.

24. Find the side of the square whose perimeter is 20 m.

10. Two sides of a triangle are 12 cm and 14 cm. The perimeter of the triangle is 36 cm. What is its third side?

25. Find the areas of the rectangles whose sides are:

(A) 3 cm and 4 cm

(B) 12 m and 21 m

26. Write the following fractions as mixed fractions.
(A) 83
(B) 127
(C) 259

27. Express the following mixed fractions as improper fractions:
(A) 135
(B) 618
(C) 317
(D) 114

28. Figure out the number of whole units in each of the following fractions.
(A) 95
(B) 73
(C) 318

29. Nairitee took 78 hour to paint a table and 23 hour to paint a chair. How much time did he take in painting both items?

30. Out of $\frac{12}{17}$ m of cloth given to a tailor, $\frac{1}{5}$ m were used. Find the length of cloth unused.

31. Nairitee has \$6 $\frac{4}{7}$. She gives \$4 $\frac{2}{3}$ to her mother. How much money does she have now?

32. Nitheeya and Nairitee $\frac{3}{10}$ and $\frac{1}{6}$ of a cake respectively. What portion of the cake did they eat together?

33. $\frac{4}{7}$ Type equation here.of a number is 84. Find the number.

MULTIDISCIPLINARY PROJECT(MDP)

Project Title: Fitness and Performance Analysis in Sports

Objective:

To analyze how various mathematical concepts can be applied to assess health and performance in sports. The project will focus on understanding measurements related to physical fitness, heart rates, body mass index (BMI), speed, and performance improvements over time.

Materials Needed:

- Access to sports activities (running, jumping, or any physical exercises)
- Stopwatch
- Scale (to measure body weight)
- Measuring tape (for height, waist circumference)
- Calculator
- Graphing paper or digital tools (like Excel or Google Sheets)
- Internet access for research (optional)

Key Concepts and Activities:

A)Body Mass Index (BMI) Calculation:

- **Formula**: BMI = Weight (kg) / (Height (m))²
- Students will calculate the BMI of at least 5 persons to determine if they are in a healthy weight range. They can also compare BMI values to athletes in various sports to see how BMI affects performance.
- **Task**: Collect data on height and weight of participants. Calculate their BMI and categorize them into underweight, normal weight, overweight, or obese according to the BMI scale. Find out and write down how different sports may require different BMI ranges.

B)Heart Rate and Exercise:

- **Formula**: Heart Rate = Number of beats per minute
- Students will measure their heart rate before, during, and after exercise (e.g., running or jumping jacks) to understand how exercise affects heart rate.
- **Task**: After a short exercise (e.g., running for 3 minutes), measure heart rate before and immediately after exercise to see the increase. Students can analyze how long it takes for the heart rate to return to normal.
- **Graphing**: Students to create a graph showing the heart rate versus time during and after exercise.

(Steps to Complete the Project:

1. **Introduction (1 page)**:
   - Explain the purpose of the project, and why math is important in understanding sports and health.
2. **Data Collection (3-4 pages)**:
   - Include charts, tables, and measurements collected from various activities (BMI, heart rate, speed, etc.).
3. **Mathematical Calculations (3-4 pages)**:

    - Show all formulas and calculations performed during the project. For example, if you calculate BMI, show the height and weight used, the formula, and the resulting BMI.
4. **Graphical Representation (2-3 pages)**:
    - Create graphs for heart rate changes, performance improvements, speed, and other relevant data. Students can use Excel or Google Sheets to generate the graphs and interpret them.
5. **Analysis and Conclusion (1-2 pages)**:
    - Analyze the data: What did the student learn about fitness and sports performance through math? What trends were observed? Discuss any interesting findings.
6. **Reflection (1 page)**:
    - Students can reflect on how their understanding of math has improved through this project and how the knowledge can be applied to real-life sports scenarios.

Conclusion:

This project will help 8th-grade students understand how math plays a crucial role in tracking and improving health and sports performance. By calculating BMI, measuring heart rate, tracking speed, and analyzing performance, students will gain insight into the relationship between physical health and mathematical data**.)**

LEARNERS DIARY

TO WRITE LEARNER'S DIARY OF 4 CHAPTERS OF TERM -2 (IF NOT YET DONE)

KENDRIYA VIDYALAYA DRDO BENGALURU

WINTER BREAK HOMEWORK

CLASS 7

SUBJECT – MATHEMATICS

INSTRUCTIONS :

1)HOME WORK OF THE 4 CHAPTERS TO BE DONE NEATLY ,IN HOLIDAY HOME WORK NOTEBOOK .

2) LEARNER'S DIARY (IF NOT YET DONE) TO BE DONE IN HHW NOTEBOOK.

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MULTIPLE CHOICE QUESTIONS

1. In the standard form of a rational number, the common factor of

numerator and denominator is always:

(a) 0 (b) 1 (c) – 2 (d) 2

2. Which of the following rational numbers is equal to its reciprocal?

(a) 1 (b) 2 (c) $\frac{1}{2}$ (d) 0

3. The reciprocal of $\frac{1}{2}$ is

(a) 3 (b) 2 (c) – 1 (d) 0

4. In the standard form of a rational number, the denominator is

always a

(a) 0 (b) negative integer (c) positive integer (d) 1

5. To reduce a rational number to its standard form, we divide its numerator and denominator by their

(a) LCM (b) HCF (c) product (d) multi ple

6.Area of a right triangle is 54 cm2. If one of its legs is 12 cm long, its perimeter is

(a) 18 cm (b) 27 cm (c) 36 cm (d) 54 cm

7.36 unit squares are joined to form a rectangle with the least perimeter. Perimeter of the rectangle is

(a) 12 units (b) 26 units (c) 24 units (d) 36 units

8. A wire is bent to form a square of side 22 cm. If the wire is rebent to form a circle, its radius is

(a) 22 cm (b) 14 cm (c) 11 cm (d) 7 cm

9.Area of a rectangle and the area of a circle are equal. If the dimensions of the rectangle are 14cm × 11 cm, then radius of the circle is

(a) 21 cm (b) 10.5 cm (c) 14 cm (d) 7 cm.

10. The coefficient of xy in $3x^2 zy + 7xyz – 2z^2x$ is

(a) 3z (b) – 2 (c) 7yz (d) 7z

11.An algebraic expression containing three terms is called a

(a) monomial (b) binomial (c) trinomial (d) All of these

12.The subtraction of 5 times of y from x is

(a) 5x – y (b) y – 5x (c) x – 5y (d) 5y – x

13. x is a non-zero rational number. Product of the square of x with the cube of x is equal to the

(a) second power of x (b) third power of x (c) fifth power of x (d) sixth power of x

14.In standard form, the number 72105.4 is written as 7.21054×10^n where n is equal to

(a) 2 (b) 3 (c) 4 (d) 5

15.$(1^0 + 2^0 + 3^0)$ is equal to

(a) 0 (b) 1 (c) 3 (d) 6

LONG ANSWER QUESTIONS

16.Write a rational number in which the numerator is less than '–7 × 11' and the denominator is greater than '12 + 4'.

17.If 12 shirts of equal size can be prepared from 27m cloth, what is length of cloth required for each shirt?

18. The perimeter of a rectangle is 40m . Its length is four meters less than five times its breadth. Find the area of Rectangle.

19. Simplify the expression by combining the like terms:

$7x^3 – 3x^2y + xy^2 + x^2y – y^3$

20. Subtract the sum of $– 3x^3y^2 + 2x^2y^3$ and $– 3x^2y^3 – 5y^4$ from $x^4 + x^3 y^2 + x^2y^3 + y^4$.

21. Find the value of the following expressions at a = 1 and b = –2:

(i) $a^2 + b^2 + 3ab$ (ii) $a^3 + a^2b + ab^2 + b^3$

22.Write the following statements in the form of algebraic expressions

and write whether it is monomial, binomial or trinomial.

(a) x is multiplied by itself and then added to the product of x and y.

(b) Three times of p and two times of q are multiplied and then subtracted from r.

(c) Product of p, twice of q and thrice of r .

(d) Sum of the products of a and b, b and c and c and a.

(e) Perimeter of an equilateral triangle of side x.

(f) Perimeter of a rectangle with length p and breadth q.

(g) Area of a triangle with base m and height n.

(h) Area of a square with side x.

(i) Cube of s subtracted from cube of t.

(j) Quotient of x and 15 multiplied by x.

(k) The sum of square of x and cube of z.

(l) Two times q subtracted from cube of q.

23.Add the following expressions:

(a) $p^2 – 7pq – q^2$ and $– 3p^2 – 2pq + 7q^2$

(b) $x^3 – x^2y – xy^2 – y^3$ and $x^3 – 2x^2y + 3xy^2 + 4y$

(c) ab + bc + ca and – bc – ca – ab

24.How much is $21a^3 – 17a^2$ less than $89a^3 – 64a^2 + 6a + 16$?

25.By what number should we multiply 3^3 so that the product may be equal to 3^7?

26. Express 648 in exponential notation.

27. Express 2,36,00,000 in standard form.

28. Express the following in exponential form :

(a) 3 × 3 × 3 × a × a × a ×a

(b) a × a × b × b × b × c × c × c × c

(c) s × s × t × t × s × s × t

29. The speed of light in vaccum is 3×10^8 m/s. Sunlight takes about 8 minutes to reach the earth. Express distance of Sun from Earth in standard form.

30. Express the following in usual form:

(a) 8.01×10^7

(b) 1.75×10^{-3}

6) MDP(MULTIDISCIPLINARY PROJECT)

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    - Analyze the data: What did the student learn about fitness and sports performance through math? What trends were observed? Discuss any interesting findings.
6. **Reflection (1 page)**:
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Conclusion:

This project will help 7th-grade students understand how math plays a crucial role in tracking and improving health and sports performance. By calculating BMI, measuring heart rate, tracking speed, and analyzing performance, students will gain insight into the relationship between physical health and mathematical data**.)**

7)LEARNERS DIARY

TO WRITE LEARNER'S DIARY OF 4 CHAPTERS OF TERM -2 (IF NOT YET DONE)

THE END

ENJOY YOUR HOLIDAYS

KENDRIYA VIDYALAYA DRDO ,BENGALURU

CLASS-8 – MATHS – WINTER BREAK HHW

INSTRUCTIONS :

1)HOME WORK OF THE 5 CHAPTERS TO BE DONE NEATLY ,IN HOLIDAY HOME WORK NOTEBOOK .

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3) MDP TO BE DONE IN A4 SHEET PAPERS .

1) ALGEBRAIC EXPRESSIONS

2 MARKS QUESTIONS

Q13. Determine the total length of the wire required to fence a rectangular park with measurements $(4p^2 + 5p + 7)$ and $3p$ as its length and breadth respectively. [AO2]

Q14. Find the volume of cuboidal box whose dimensions are 0.5a; 4b; 1.5c [AO1]

Q15. Show that $a(a+b+c) + b(b+c+a) + c(c+a+b) - a(b+c+a) - b(c+a+b) - c(a+b+c) = 0$ [AO2]

Q16. Fill in the blanks with correct answer, in the following addtion: [AO2]

$12a - 9ab + 5b - 3$

$(\ldots) - 7ab + (\ldots) + 12$ (add)

$8a - (\ldots) + 2b - (\ldots)$

Q17. i) add $(-m^2)$ and $(-3m^2)$. [AO1]

ii) multiply $(-m^2)$ and $(-3m^2)$. [AO1]

Are the answers same in the above bits? [AO1]

3 MARKS QUESTIONS

Q18. Find the product of $(a + b)$ and $(2a - 3b + c)$. Also find the product of $(2a - 3b + c)$ and $(a + b)$. Are the results same in both the cases. If it is so, then write the name of the property used here. [AO1]

Q19. On the occasion of Independence day, a walking programme was planned by the students and teachers of class 8th of a school, to instill the patriotism among the people, in a quadrilateral shaped public park, whose sides are represented as $(x^2 + x - 1)$, $(2x^2 - 3x + 1)$ $(5x^2 - 4x - 2)$ and $(7x^2 - 4x + 8)$. Determine the total length covered by them in one round, along the boundary of the park. [AO1]

Q20. Simplify $\left(\frac{3}{4}x - \frac{4}{3}y\right)\left(\frac{2}{3}x + \frac{3}{2}y\right)$ and also evaluate the product so obtained if $x = 1$ and $y = -1$. [AO2]

ASSERTION AND REASON QUESTIONS

In these questions two statements are provided. One is Assertion (A) statement and the other one is Reason (R) statement. By reading the statements carefully, choose the correct option.

a) Both Assertion (A) and Reason (R) are 'True' and Reason (R) is the correct explanation of the Assertion (A).

b) Both Assertion (A) and Reason (R) are 'True' and Reason (R) is not the correct explanation of the Assertion (A).

c) Assertion (A) is 'True' but Reason (R) is 'False'.

d) Assertion (A) is 'False' but Reason (R) is 'True'.

Q9. Assertion (A): The volume of a rectangular box, whose length, breadth and height are 2ax; 3by and 5cz respectively, is 30abcxyz.
Reason (R): The surface area of a cuboid can be calculated by using the formula, T.S.A. = 2(lb + bh + hl) [AO1]

Q10. Assertion (A): The algebraic expressions $(x + 4)(x - 4)$ can be simplified as $x^2 - 16$.
Reason (R): The expression $(a + b)(a - b)$ can always be simplified as $a^2 - b^2$. [AO1]

Q11. Assertion (A): The algebraic expression $2x^2 + 3x - 5$ is binomial.
Reason (R): An algebraic expression which has three terms is known as trinomial. [AO1]

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2)MENSURATION

2 MARKS QUESTIONS

13. Calculate the area of a rectangle with a length of 15 cm and a width of 6 cm. (AO1)

14. A circular pond has a radius of 5 meters. Find the circumference of the pond. Use (π= approx 3.14). (AO1)

15. If the height of a triangular garden is 12 m and the area is 36 m^2, find the length of the base of the triangle. (AO1)

16. Calculate the volume of a cube with a side length of 5 cm. (AO1)

17. A cylindrical water tank has a radius of 4 m and a height of 6 m. What is the total surface area of the tank? (Use ($\pi = 22/7$)) (AO2)

3 MARKS QUESTIONS

18) A rectangular garden has a length of 14 meters and a breadth of 10 meters. Calculate the area of the garden and also find the perimeter. (AO1)

19) A circular pond has a radius of 5 meters. Find the circumference of the pond. Use (π= approx 3.14). (AO1)

20) A cube has a side length of 6 cm. Determine the total surface area of the cube. (AO1)

21 Calculate the volume of a cylindrical container with a radius of 7 cm and a height of 12 cm. Use (π= approx 3.14). (AO2)

22) A triangular park has a base of 10 meters and a height of 8 meters. Find the area of the park and its height if the area were doubled. (AO2)

3)EXPONENTS AND POWER

2 MARK QUESTIONS

15. Convert 5 hectares in m^2 and express it in standard form.

16. Find the product of cube of 3 and square of 2.

3 MARK QUESTIONS

18. The number of red blood cells per cubic millimeter of blood is approximately 5.5 million. If the average body contains 5L of blood, what is the total number of red cells in the body? Write in standard form. (1L= 1000000mm^3) [AO2]

19. Find the value of x^{-3}, if $x = 100^{1-4} \div 100^0$ [AO1]

20. If $5^{3x-1} \div 25 = 125$, then find the value of x. [AO2]

21. Express $\frac{1.5\times10^{-6}}{2.5\times10^{4}}$ in the standard form. [AO2]

22. The cells of a bacteria double itself every hour. How many cells will there be after 12 hour, if initially we start with 1 cell? Express the answer in powers. [AO2]

5 MARK QUESTIONS

23. If the size of a red blood cell is 0.0000007m and the size of a plant cell is 0.00001275m, then what is the difference between the sizes of the red blood cell and the plant cell? Which one has the greater size? [AO2]

24. If $a = -1$ and $b = 2$, then find the value of the following:

(a) $a^b + b^a$ (b) $a^b \div b^a$ [AO1]

4)INVERSE AND DIRECT PROPORTION

5 MARKS QUESTIONS

23) The purpose of the Scout and guides movement is to contribute to the development of young people in achieving their full physical, intellectual, emotional, social and spiritual potentials as individuals, as responsible citizens and as members of local, national and international communities. A four days scout and guide camp were arranged by the school for class 8 students. The students were so excited to go for the camp. Based on this context, answer the following question: (AO2)

i) The school arranged 6 buses to take 150 students to the camp. If 75 more students are joined, how many buses are required in all?

or

In the camp, they assigned some jobs to the students. 45 persons complete a job in 20 minutes. How many minutes will 30 persons take to complete the same job? (AO2)

ii) The camp has enough food for 150 students for 6 days. How long will the food last if 50 students were shifted to another camp?2 marks (AO2)

iii) In the camp activities, there was a competition of writing words. Manvi can write 200 words in 30 minutes. How many words she will write in 12 minutes? 1 mark (AO1)

CASE BASED QUESTIONS

26) Nita invited four friends for her birthday party. She ordered Red velvet cake, pizza and juice.

i) The cost 2 kg cake is ₹ 300. If Nita ordered 5kg cake, how much she paid for it? 1 mark (AO1)

ii) Nita and her friends had eaten 2 pieces of pizza each.. Then find the total number of pieces consumed by Nitha and her friends. 1 mark (AO1)

iii) The rent of party hall was ₹ 1200 for 2 hours. Nita's party started at 5:00 pm and ended by 8:30 pm. what amount did she pay for the party hall? (2 marks) (AO2)

28) Many schools have a recommended students-teacher ratio as 30:1. A school has 8 periods a day each of 45 minutes duration. The school management decided to increase the number of periods in a day so that more classes can be taken in a single day. However, they want to keep the school duration the same. Next year, school expects 270 students.

i) How many teachers will they have to appoint to maintain the students-teacher ratio? (2marks) (AO2)

ii) What will be the duration of new periods if the number of periods is increased to 10 (2 marks) (AO2)

29) Jagjith Singh has a road map with a scale of 1 cm = 20 km. Based on the above information, answer the following questions:

(i) He drives on a road for 72 km. What would be his distance covered in the map? 2MARKS (AO2)

(ii) Suppose the distance between two places on the map is 3.5cm, find the exact distance between the two places. 1MARK (AO1)

(iii) Jagjith Singh went from place a to b to meet his parents and then b to c to join his office. If the distance between a and b is 4cm, the distance between b and c is 2 cm on the map, total how much distance is covered by Jagjith Singh. 1 MARK (AO1)

5)LINEAR EQUATIONS

2 MARKS QUESTIONS

Q13) If four times , 10 more than a number is equal to five times the number, find the number.(AO2)

Q14) Find the value of x for which the expressions $3x - 4$ and $2x + 1$ become equal. (AO2)

Q15) What can be the possible values of 'x 'if perimeter of a regular polygon with sides less than 10 is 84 cm (AO2)

Q16) Solve the equation: $2x - 5 = 3(x-1) + 4$ (AO1)

Q17) Consecutive integers always increase by 1. It is given that sum of three consecutive integers is 372. If first integer is x, find the three integers. (AO2)

3 MARKS QUESTIONS

Q18) A garden has a perimeter of 70 m. If length is 5m more than its breadth, find the dimensions of the garden. If fencing is to be done around garden, what is the total cost of wire if 1m of wire costs Rs 50? (AO2)

Q19) If $\frac{5x}{3} - 4 = \frac{2x}{5}$, find the value of $19x + 3$ (AO1)

Q20) At a retail store, the cost of a plastic pot is ₹50 more than the cost of a broomstick. If the ratio of the cost of two pots to the cost of three broomsticks is 5:6, what is the cost of the pot? (AO2)

6) MDP(MULTIDISCIPLINARY PROJECT)

Project Title: Fitness and Performance Analysis in Sports

Objective:

To analyze how various mathematical concepts can be applied to assess health and performance in sports. The project will focus on understanding measurements related to physical fitness, heart rates, body mass index (BMI), speed, and performance improvements over time.

Materials Needed:

- Access to sports activities (running, jumping, or any physical exercises)
- Stopwatch
- Scale (to measure body weight)
- Measuring tape (for height, waist circumference)
- Calculator
- Graphing paper or digital tools (like Excel or Google Sheets)
- Internet access for research (optional)

Key Concepts and Activities:

A)Body Mass Index (BMI) Calculation:

- **Formula**: BMI = Weight (kg) / (Height (m))²
- Students will calculate the BMI of at least 5 persons to determine if they are in a healthy weight range. They can also compare BMI values to athletes in various sports to see how BMI affects performance.
- **Task**: Collect data on height and weight of participants. Calculate their BMI and categorize them into underweight, normal weight, overweight, or obese according to the BMI scale. Find out and write down how different sports may require different BMI ranges.

B)Heart Rate and Exercise:

- **Formula**: Heart Rate = Number of beats per minute
- Students will measure their heart rate before, during, and after exercise (e.g., running or jumping jacks) to understand how exercise affects heart rate.
- **Task**: After a short exercise (e.g., running for 3 minutes), measure heart rate before and immediately after exercise to see the increase. Students can analyze how long it takes for the heart rate to return to normal.
- **Graphing**: Students to create a graph showing the heart rate versus time during and after exercise.

(Steps to Complete the Project:

1. **Introduction (1 page)**:
   - Explain the purpose of the project, and why math is important in understanding sports and health.
2. **Data Collection (3-4 pages)**:
   - Include charts, tables, and measurements collected from various activities (BMI, heart rate, speed, etc.).
3. **Mathematical Calculations (3-4 pages)**:
   - Show all formulas and calculations performed during the project. For example, if you calculate BMI, show the height and weight used, the formula, and the resulting BMI.

4. **Graphical Representation (2-3 pages)**:
    - Create graphs for heart rate changes, performance improvements, speed, and other relevant data. Students can use Excel or Google Sheets to generate the graphs and interpret them.
5. **Analysis and Conclusion (1-2 pages)**:
    - Analyze the data: What did the student learn about fitness and sports performance through math? What trends were observed? Discuss any interesting findings.
6. **Reflection (1 page)**:
    - Students can reflect on how their understanding of math has improved through this project and how the knowledge can be applied to real-life sports scenarios.

Conclusion:

This project will help 8th-grade students understand how math plays a crucial role in tracking and improving health and sports performance. By calculating BMI, measuring heart rate, tracking speed, and analyzing performance, students will gain insight into the relationship between physical health and mathematical data**.)**

7)LEARNERS DIARY

TO WRITE LEARNER'S DIARY OF 4 CHAPTERS OF TERM -2 (IF NOT YET DONE)

KENDRIYA VIDYALAYA DRDO, BANGALORE

Class IX Session 2024-25
Subject - Mathematics
Sample Question Paper - 1

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment carrying 04 marks each.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

Section A

1. The point which lies on x-axis at a distance of 3 units in the positive direction of x-axis is **[1]**

   a) (0, -3) b) (0, 3)

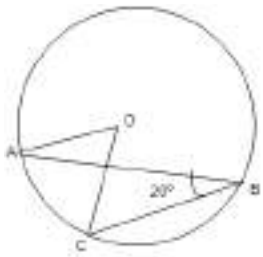
   c) (3, 0) d) (-3, 0)

2. The length of the sides of a triangle are 5 cm, 7 cm and 8 cm. Area of the triangle is : **[1]**

   a) $100\sqrt{3}$ cm^2 b) $10\sqrt{3}$ cm^2

   c) 300 cm^2 d) $50\sqrt{3}$ cm^2

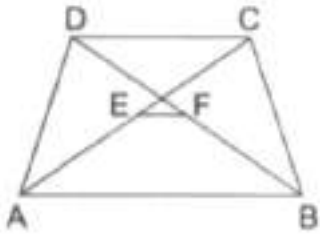
3. In the figure, O is the centre of the circle. If $\angle ABC = 20^o$, then $\angle AOC$ is equal to : **[1]**



   a) 60^o b) 10^o

   c) 40^o d) 20^o

4. In a trapezium ABCD, E and F be the midpoints of the diagonals AC and BD respectively. Then, EF = ? **[1]**



a) $\frac{1}{2}AB$

b) $\frac{1}{2}(AB+CD)$

c) $\frac{1}{2}(AB-CD)$

d) $\frac{1}{2}CD$

5. The value of $x^{p-q}\,x^{q-r}\,x^{r-p}$ is equal to **[1]**

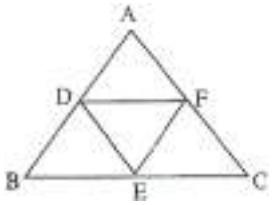
a) x^{pqr}

b) 0

c) x

d) 1

6. D, E and F are the mid points of sides AB, BC and CA of ΔABC. If perimetre of ΔABC is 16 cm, then perimetre of ΔDEF. **[1]**



a) 32 cm

b) 8 cm

c) 28 cm

d) 4 cm

7. x = 2, y = -1 is a solution of the linear equation **[1]**

a) 2x + y = 0

b) x + 2y = 0

c) x + 2y = 4

d) 2x + y = 5

8. If x - 3 is a factor of x^2 - ax -15, then a = **[1]**

a) 5

b) -2

c) -5

d) 3

9. The value of $15\sqrt{15} \div 3\sqrt{5}$ is **[1]**

a) $5\sqrt{3}$

b) $3\sqrt{5}$

c) 3

d) 5

10. ABCD is a parallelogram. If is produced to E such that ED bisects BC at O. Then which of the following is correct? **[1]**

a) OC = BE

b) OE = OC

c) AB = OE

d) AB = BE

11. An irrational number between $\frac{1}{7}\ and\ \frac{2}{7}$ is **[1]**

a) $\sqrt{\frac{1}{7}\times\frac{2}{7}}$

b) $\frac{1}{2}\left(\frac{1}{7}-\frac{2}{7}\right)$

c) $\left(\frac{1}{7}\times\frac{2}{7}\right)$

d) $\frac{1}{2}\left(\frac{1}{7}+\frac{2}{7}\right)$

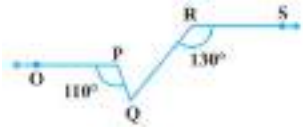
12. How many linear equations in ‘x’ and ‘y’ can be satisfied by x = 1, y = 2? **[1]**

a) Infinitely many

b) Two

c) Only one d) Three

13. In a figure, if OP||RS, ∠OPQ = 110° and ∠QRS = 130°, then ∠PQR is equal to **[1]**



a) 40° b) 50°

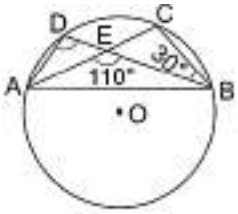
c) 70° d) 60°

14. After rationalising the denominator of $\frac{7}{3\sqrt{3}-2\sqrt{2}}$, we get the denominator as **[1]**

a) 5 b) 35

c) 19 d) 13

15. In the given figure, O is the centre of a circle and chords AC and BD intersect at E. If ∠AEB = 110° and ∠CBE = 30°, then ∠ADB = ? **[1]**



a) 80° b) 60°

c) 90° d) 70°

16. x co-ordinate is known as **[1]**

a) Origin b) Points

c) Abscissa d) Ordinate

17. If (-2, 5) is a solution of 2x + my = 11, then the value of 'm' is **[1]**

a) -2 b) 2

c) 3 d) -3

18. The value of $\frac{(a^2-b^2)^3+(b^2-c^2)^3+(c^2-a^2)^3}{(a-b)^3+(b-c)^3+(c-a)^3}$ is **[1]**

a) 3(a - b)(b - c)(c - a) b) (a + b)(b + c)(c + a)

c) 3(a + b)(b + c)(c + a)(a - b)(b - c)(c - a) d) 2(a - b)(b - c)(c - a)

19. **Assertion (A):** If the diagonals of a parallelogram ABCD are equal, then ∠ABC = 90^o **[1]**

Reason (R): If the diagonals of a parallelogram are equal, it becomes a rectangle.

a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

20. **Assertion (A):** $2+\sqrt{6}$ is an irrational number. **[1]**

Reason (R): Sum of a rational number and an irrational number is always an irrational number.

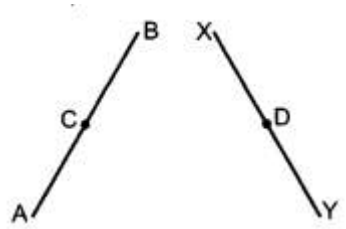
a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

21. In fig. AC = XD, C is the mid-point of AB and D is the mid-point of XY. Using a Euclid's axiom, show that AB = XY. **[2]**



22. In fig., if AC = BD, then prove that AB = CD **[2]**

23. Name the quadrants in which the following points lie : **[2]**

(i) p(4, 4)

(ii) Q(–4, 4)

(iii) R(–4, –4)

(iv) S(4, –4)

24. If x = $3 + 2\sqrt{2}$, find the value of $\left(x^2 + \frac{1}{x^2}\right)$. **[2]**

OR

Prove that: $\frac{1}{3+\sqrt{7}} + \frac{1}{\sqrt{7}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{3}} + \frac{1}{\sqrt{3}+1} = 1$.

25. The radii of two cones are in the ratio 2 : 1 and their volumes are equal. What is the ratio of their heights? **[2]**

OR

A hollow spherical shell is made of a metal of density 4.5 g per cm^3. If its internal and external radii are 8 cm and 9 cm respectively, find the weight of the shell.

Section C

26. Locate $\sqrt{10}$ on the number line. **[3]**

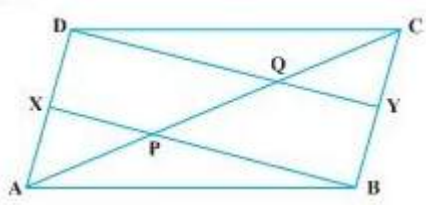
27. A random survey of the number of children of various age groups playing in a park was found as follows : **[3]**

Age (in years)	**Number of children**
1-2	5
2-3	3
3-5	6
5-7	12
7-10	9
10-15	10
15-17	4

Draw a histogram to represent the data above.

28. In Fig. X and Y are respectively the mid-points of the opposite sides AD and BC of a parallelogram ABCD. **[3]**

Also, BX and DY intersect AC at P and Q, respectively. Show that AP = PQ = QC.



29. Find the solution of the linear equation x + 2y = 8 which represents a point on **[3]**

i. The x-axis

ii. The y-axis

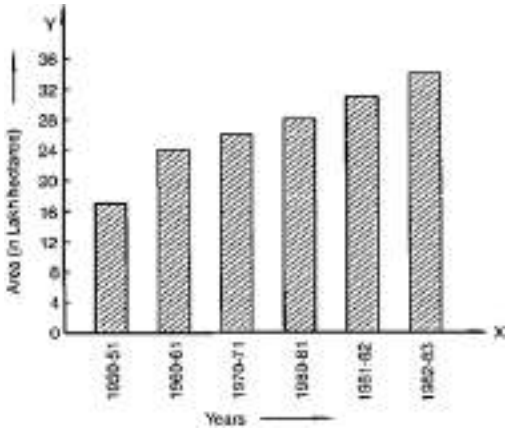
30. The marks scored by 750 students in an examination are given in the form of a frequency distribution table. **[3]**

Marks:	600-640	640-680	680-720	720-760	760-800	800-840	840-880
No. of Students:	16	45	156	284	172	59	18

Represent this data in the form of a histogram and construct a frequency polygon.

OR

Read the bar graph given in Figure and answer the following questions:



i. What information is given by the bar graph?

ii. In which years the areas under the sugarcane crop were the maximum and the minimum?

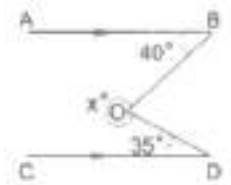
iii. State whether true or false:

The area under the sugarcane crop in the year 1982-83 is three times that of the year 1950-51.

31. If both (x- 2) and $\left(x-\frac{1}{2}\right)$ are factors of px^2+5x+r , Show that p = r. **[3]**

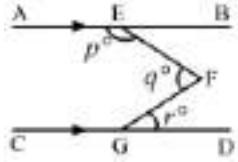
Section D

32. In the given figure, AB || CD, $\angle ABO = 40°$, $\angle CDO = 35°$. Find the value of the reflex ∠BOD and hence the value of x. **[5]**



OR

In the given figure, AB || CD. Prove that p + q - r = 180.



33. What length of tarpaulin 3 m wide will be required to make conical tent of height 8 m and base radius 6 m? **[5]**

Assume that the extra length of material that will be required for stitching margins and wastage in cutting is approximately 20 cm. (Use $\pi = 3.14$)

34. The length of the sides of a triangle are in the ratio 3 : 4 : 5 and its perimeter is 144 cm. Find the area of the triangle and the height corresponding to the longest side **[5]**

OR

Two sides of a triangular field are 85 m and 154 m in length and its perimeter is 324 m. Find the area of the field.

35. Using factor theorem, factorize the polynomial: $x^3 - 6x^2 + 3x + 10$ **[5]**

Section E

36. **Read the following text carefully and answer the questions that follow:** **[4]**

Peter, Kevin James, Reeta and Veena were students of Class 9th B at Govt Sr Sec School, Sector 5, Gurgaon.

Once the teacher told **Peter to think a number x and to Kevin to think another number y** so that the difference of the numbers is 10 (x > y).

Now the teacher asked James to add double of Peter's number and that three times of Kevin's number, the total was found 120.

Reeta just entered in the class, she did not know any number.

The teacher said Reeta to form the 1st equation with two variables x and y.

Now Veena just entered the class so the teacher told her to form 2nd equation with two variables x and y.

Now teacher Told Reeta to find the values of x and y. Peter and kelvin were told to verify the numbers x and y.

i. What are the equation formed by Reeta and Veena? (1)

ii. What was the equation formed by Veena? (1)

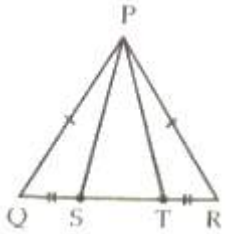
iii. Which number did Peter think? (2)

OR

Which number did Kelvin think? (2)

37. **Read the following text carefully and answer the questions that follow:** **[4]**

A children's park is in the shape of isosceles triangle said PQR with PQ = PR, S and T are points on QR such that QT = RS.



i. Which rule is applied to prove that congruency of △PQS and △PRT. (1)

ii. Name the type of △PST. (1)

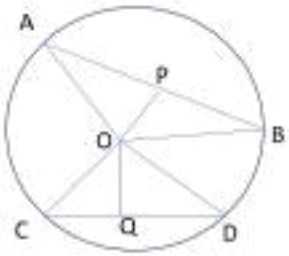
iii. If PQ = 6 cm and QR = 7 cm, then find perimeter of △PQR. (2)

OR

If $\angle QPR = 80^o$ find $\angle PQR$? (2)

38. **Read the following text carefully and answer the questions that follow:** **[4]**

Rohan draws a circle of radius 10 cm with the help of a compass and scale. He also draws two chords, AB and CD in such a way that the perpendicular distance from the center to AB and CD are 6 cm and 8 cm respectively. Now, he has some doubts that are given below.



i. Show that the perpendicular drawn from the Centre of a circle to a chord bisects the chord. (1)

ii. What is the length of CD? (1)

iii. What is the length of AB? (2)

OR

How many circles can be drawn from given three noncollinear points? (2)

KENDRIYA VIDYALAYA DRDO, BANGALORE

SAMPLE PAPER 02

SUBJECT: MATHEMATICS **MAX. MARKS : 80**

CLASS : IX **DURATION : 3 HRS**

General Instruction:

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

SECTION – A

Questions 1 to 20 carry 1 mark each.

1. The value of $\left(\sqrt{5}+\sqrt{2}\right)^2$ is:

(a) $7+2\sqrt{5}$ (b) $1+5\sqrt{2}$ (c) $7+2\sqrt{10}$ (d) $7-2\sqrt{10}$

2. The value of $9^{\frac{3}{2}}$ is :

(a) 18 (b) 27 (c) – 18 (d) $\frac{1}{27}$

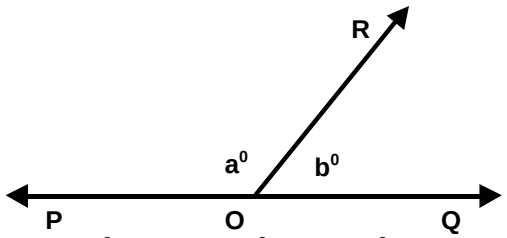
3. If $\left(\frac{3}{4}\right)^6 \times \left(\frac{16}{9}\right)^5 = \left(\frac{4}{3}\right)^{x+2}$, then the value of x is

(a) 2 (b) 4 (c) -2 (d) 6

4. The value of $p(x) = 5x - 4x^2 + 3$ for $x = -1$ is:

(a) 6 (b) –6 (c) 3 (d) – 3

5. In fig. $\angle POR$ and $\angle QOR$ form a linear pair if $a - b = 80^0$ then values of a and b respectively are:



(a) 130^0 and 50^0 (b) 50^0 and 130^0 c) 60^0 and 120^0 (d) 40^0 and 140^0

6. On dividing $x^3 + 3x^2 + 3x + 1$ by $5 + 2x$ we get remainder:

(a) $\frac{8}{27}$ (b) $\frac{27}{8}$ (c) $-\frac{27}{8}$ (d) $-\frac{8}{27}$

7. How many linear equations in x and y can be satisfied by x = 1 and y = 2?

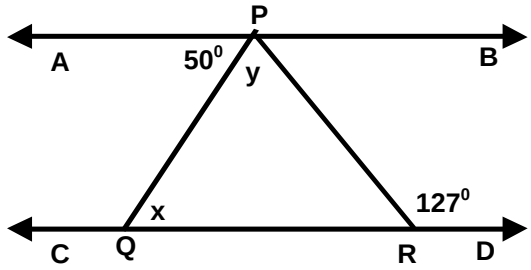
(a) only one (b) two (c) infinitely many (d) three

8. x = 5, y = 2 is a solution of the linear equation

(a) x + 2y = 7 (b) 5x + 2y = 7 (c) x + y = 7 (d) 5x + y = 7

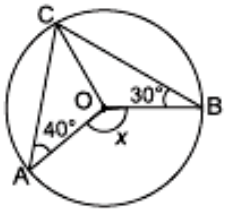
9. The graph of the linear equation $2x + 3y = 6$ is a line which meets the x axis at the point
(a) (2, 0) (b) (0, 3) (c) (3, 0) (d) (0, 2)

10. In fig., AB || CD, $\angle APQ = 50^0$, $\angle PRD = 127^0$, then the value of x and y respectively are
(a) 50^0 and 77^0 (b) 40^0 and 85^0 c) 60^0 and 90^0 (d) 85^0 and 75^0

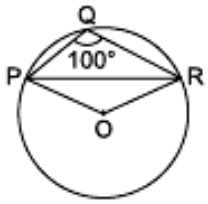


11. An angle is 20^0 more than three times the given angle. If the two angles are supplementary the angles are
(a) 20^0 and 160^0 (b) 40^0 and 140^0 c) 60^0 and 120^0 (d) 70^0 and 110^0

12. In the given figure, O is the centre of the circle. The value of x is
(a) 140° (b) 70° (c) 290° (d) 210°



13. In the given figure, the value of $\angle OPR$ is
(a) 65° (b) 10° (c) 20° (d) 50°



14. ΔABC is right triangle in which $\angle A = 90^0$ and AB = AC. The values of $\angle B$ and $\angle D$ will be
(a) $\angle B = \angle C = 60^0$ (b) $\angle B = \angle C = 30^0$
(c) $\angle B = \angle C = 45^0$ (d) $\angle B = \angle C = 50^0$

15. Three angles of a quadrilateral are 75^0, 90^0 and 75^0. The fourth angle is
(a) 90^0 (b) 95^0 (c) 105^0 (d) 120^0

16. If the area of an equilateral triangle is $16\sqrt{3}\ cm^2$, then the perimeter of the triangle is:
(a) 64 cm (b) 60 cm (c) 36 cm (d) none of these

17. The area of the triangle whose sides are 42 cm, 34 cm and 20 cm in length is
(a) 150 cm^2 (b) 336 cm^2 (c) 300 cm^2 (d) none of these

18. In a frequency distribution, the mid-value of a class is 10 and width of each class is 6. The lower limit of the class is
(a) 6 (b) 7 (c) 8 (d) 12

DIRECTION: In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.
Choose the correct option

19. Assertion (A): Supplement of angle is one fourth of itself. The measure of the angle is 144^0.
Reason (R): Two angles are said to be supplementary if their sum of measure of angles is 180^0.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

20. Assertion (A): In ΔABC, AB = AC and ∠B = 50º, then ∠C is 50º.
Reason (R): Angles opposite to equal sides of a triangle are equal.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

SECTION – B

Questions 21 to 25 carry 2 marks each.

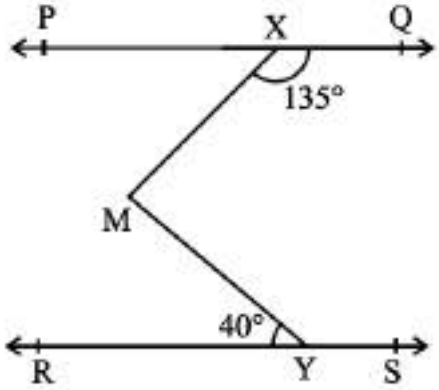
21. Simplify: $(256)^{(-4^{\frac{-3}{2}})}$

OR

Show that $1.2\overline{35}$ can be expressed in the form of $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

22. Expand: $(4a - b + 2c)^2$

23. In the below figure, if PQ || RS, ∠ MXQ = 135° and ∠ MYR = 40°, find ∠ XMY.



24. In Δ ABC, the bisector AD of ∠ A is perpendicular to side BC. Show that AB = AC and Δ ABC is isosceles.

25. A right triangle ABC with sides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained.

OR

A hemispherical bowl has a radius of 3.5 cm. What would be the volume of water it would contain?

SECTION – C

Questions 26 to 31 carry 3 marks each.

26. Factorise: (i) $6x^2 + 7x - 3$ (ii) $2x^2 - 7x - 15$

OR

Factorise: (i) $27y^3 + 125z^3$ (ii) $64m^3 - 343n^3$

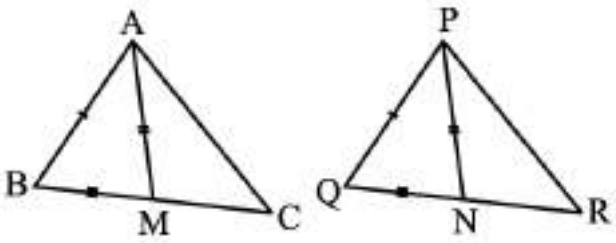
27. If $a + b + c = 9$ and $ab + bc + ca = 26$, find $a^2 + b^2 + c^2$.

28. Write the statement of Euclid's fifth postulate. How would you rewrite Euclid's fifth postulate so that it would be easier to understand?

29. Find the value of k, if x = 3, y = 2 is a solution of the equation 2x + 3y = k.
Find the points where the graph of the above equation cuts the x-axis and the y-axis.

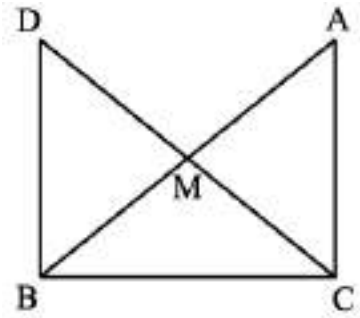
30. If two intersecting chords of a circle make equal angles with the diameter passing through their point of intersection, prove that the chords are equal.

31. Two sides AB and BC and median AM of one triangle ABC are respectively equal to sides PQ and QR and median PN of Δ PQR (see below figure). Show that:
(i) Δ ABM ≅ Δ PQN (ii) Δ ABC ≅ Δ PQR



OR

In right triangle ABC, right angled at C, M is the mid-point of hypotenuse AB. C is joined to M and produced to a point D such that DM = CM. Point D is joined to point B (see below figure). Show that:
(i) Δ AMC ≅ Δ BMD
(ii) ∠ DBC is a right angle.
(iii) Δ DBC ≅ Δ ACB

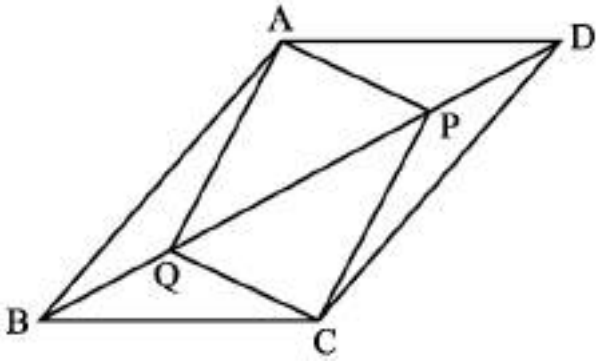


SECTION – D

Questions 32 to 35 carry 5 marks each.

32. Evaluate: $\frac{1}{\sqrt{2}+1}+\frac{1}{\sqrt{3}+\sqrt{2}}+\frac{1}{\sqrt{4}+\sqrt{3}}+.....+\frac{1}{\sqrt{9}+\sqrt{8}}$

33. In parallelogram ABCD, two points P and Q are taken on diagonal BD such that DP = BQ (see below figure). Show that:



(i) Δ APD ≅ Δ CQB (ii) AP = CQ (iii) Δ AQB ≅ Δ CPD
(iv) AQ = CP (v) APCQ is a parallelogram

OR

ABCD is a rhombus and P, Q, R and S are the mid-points of the sides AB, BC, CD and DA respectively. Show that the quadrilateral PQRS is a rectangle.

34. Draw histogram and frequency polygon for the following distribution:

C. I.	0 – 50	50 – 100	100 – 150	150 – 200	200 – 250	250 – 300
F	4	8	16	13	6	3

35. At a Ramzan Mela, a stall keeper in one of the food stalls has a large cylindrical vessel of base radius 15 cm filled up to a height of 32 cm with orange juice. The juice is filled in small cylindrical glasses (see below figure) of radius 3 cm up to a height of 8 cm, and sold for Rs 3 each. How much money does the stall keeper receive by selling the juice completely?

OR

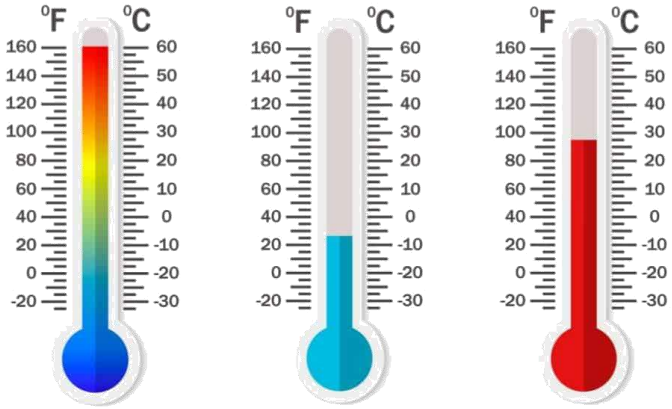
Monica has a piece of canvas whose area is 551 m^2. She uses it to have a conical tent made, with a base radius of 7 m. Assuming that all the stitching margins and the wastage incurred while cutting, amounts to approximately 1 m2, find the volume of the tent that can be made with it.

SECTION – E(Case Study Based Questions)

Questions 36 to 38 carry 4 marks each.

36. Case Study – 1

Temperature can be measured in both Fahrenheit and Celsius scale. Both are the standard units for measuring temperature. There is a conversion formula by which Fahrenheit temperature can be converted into Celsius temperature. This formula is in the form of a linear equation: $F = \left(\frac{9}{2}\right)C + 32$, where, F and C are the temperatures in Fahrenheit and Celsius.



(i) If Celsius scale is taken on x-axis, then what is the point on X-axis, where this linear equation cuts the X-axis. [1]

(ii) At what point does this linear equation, cut the Y-axis ? [1]

(iii) If the temperature is 30°C, then what is the temperature in Fahrenheit? [2]

OR

(iii) If the temperature is 95°F, what is the temperature in Celsius? [2]

37. Case Study – 2

Triangles are used in bridges because they evenly distribute weight without changing their proportions. When force is applied on a shape like a rectangle it would flatten out. Before triangles were used in bridges, they were weak and could not be very big. To solve that problem engineers would put a post in the middle of a square and make it more sturdy. Isosceles triangles were used to construct a bridge in which the base (unequal side) of an isosceles triangle is 4 m and its perimeter is 20 m.

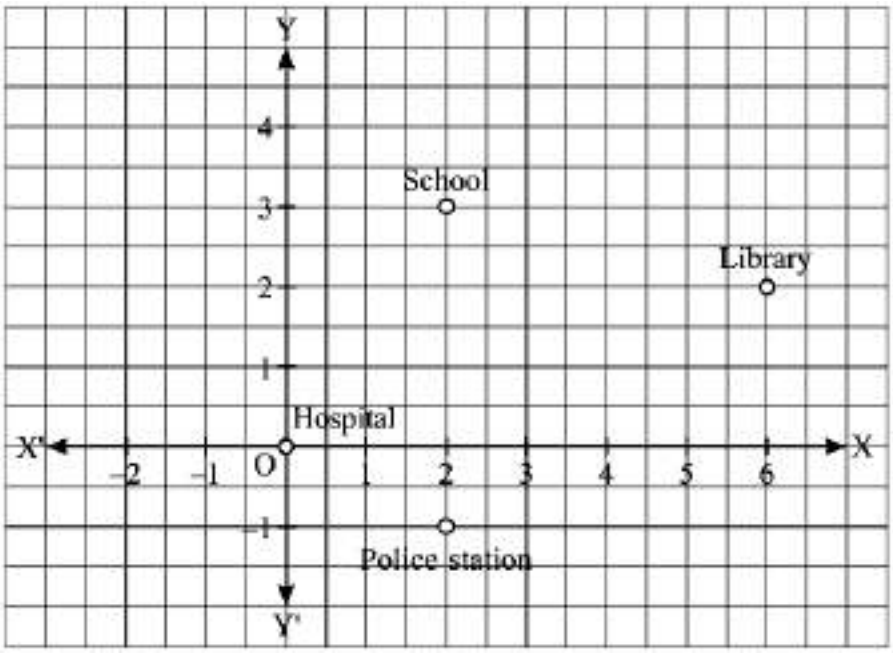
(i) What is the length of equal sides? [1]
(ii) In a ΔABC it is given that base = 12 m and height = 5 m. Find its area. [1]
(iii) What is the area of the given isosceles triangle? [2]

OR

(iii) Find the cost of covering the sheet for one isosceles triangle at the rate of Rs 200 per metre. [2]

38. Case Study – 3

Aditya is a Class IX student residing in a village. One day, he went to a city Hospital along with his grandfather for general checkup. From there he visited three places - School, Library and Police Station. After returning to his village, he plotted a graph by taking Hospital as origin and marked three places on the graph as per his direction of movement and distance. The graph is shown below:



Answer the following questions:

(i) What are the coordinates of Library? [1]
(ii) In which quadrant the point (-1, 4) lies? [1]
(iii) What are the coordinates of School and Police Station? Find the distance between school and police station. [2]

OR

(iii) Find the distance between Hospital and Library. [2]

KENDRIYA VIDYALAYA DRDO, BANGALORE
SAMPLE PAPER 03

SUBJECT: MATHEMATICS **MAX. MARKS : 80**
CLASS : IX **DURATION : 3 HRS**

General Instruction:

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

SECTION – A
Questions 1 to 20 carry 1 mark each.

1. Value of $(256)^{0.16} \times (256)^{0.09}$ is
(a) 4 (b) 16 (c) 64 (d) 256.25

2. A rational number between $\sqrt{2}$ and $\sqrt{3}$ is
(a) 1.1 (b) $\frac{\sqrt{2}.\sqrt{3}}{2}$ (c) 1.5 (d) 1.8

3. On dividing $6\sqrt{27}$ by $2\sqrt{3}$, we get
(a) $3\sqrt{9}$ (b) 6 (c) 9 (d) none of these

4. $\sqrt[3]{2} \times \sqrt[4]{3}$ is equal to
(a) 648 (b) $72^{1/12}$ (c) $432^{1/12}$ (d) $216^{1/12}$

5. Factors of $3x^2 - x - 4$ are
(a) $(x - 1)$ and $(3x - 4)$ (b) $(x + 1)$ and $(3x - 4)$
(c) $(x + 1)$ and $(3x + 4)$ (d) $(x - 1)$ and $(3x + 4)$

6. Zeros of the polynomial $p(x) = (x - 2)^2 - (x + 2)^2$ are
(a) 2, – 2 (b) 2x (c) 0, – 2 (d) 0

7. The point which lies on y-axis at a distance of 5 units in the negative direction of y-axis is
(a) (0, 5) (b) (5, 0) (c) (0, –5) (d) (–5, 0)

8. The point (5, –4) lies
(a) on the x-axis (b) on the y-axis (c) in the I quadrant (d) in the IV quadrant

9. How many linear equations in x and y can be satisfied by x = 1 and y = 2?
(a) Only one (b) Two (c) Infinitely many (d) Three

10. The equation of x-axis is of the form
(a) x = 0 (b) y = 0 (c) x + y = 0 (d) x = y

11. The equation $2x + 5y = 7$ has a unique solution, if x, y are
(a) Natural numbers (b) Positive real numbers
(c) Real numbers (d) Rational numbers

12. If two complementary angles are in the ratio 13 : 5, then the angles are
(a) 65°, 35° (b) 65°, 25° (c) 13x°, 5x° (d) 60°, 30°

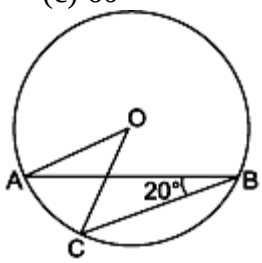
13. Angles of a triangle are in the ratio 2 : 4 : 3. The smallest angle of the triangle is
(a) 60° (b) 40° (c) 80° (d) 20°

14. Which of the following is not a criterion for congruence of triangles?
(a) SAS (b) ASA (c) SSA (d) SSS

15. In a parallelogram ABCD, AP and CQ are perpendicular drawn to the diagonal BD. On measuring it is found that ∠PAB = 65° and ∠DAB = 75°, then the measure of ∠QCD is
(a) 90° (b) 75° (c) 65° (d) 10°

16. Given a circle of radius 5 cm and centre O. OM is drawn perpendicular to the chord XY. If OM =3 cm, then length of chord XY is
(a) 4 cm (b) 6 cm (c) 8 cm (d) 10 cm

17. In figure, if ∠ABC = 20°, then ∠AOC is equal to:
(a) 20° (b) 40° (c) 60° (d) 10°



18. The area of an equilateral triangle with side $4\sqrt{3}$ cm is
(a) 20 cm^2 (b) 20 cm^2 (c) 18.784 cm^2 (d) 20.784 cm^2

DIRECTION: In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.
Choose the correct option

19. Assertion (A): 0.271 is a terminating decimal and we can express this number as 271/1000 which is of the form p/q, where p and q are integers and $q \neq 0$.
Reason (R): A terminating or non-terminating decimal expansion can be expressed as rational number.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

20. Assertion (A): The angles of a quadrilateral are x°, (x – 10)°, (x + 30)° and (2x)°, the smallest angle is equal to 58°.
Reason (R): Sum of the angles of a quadrilateral is 360°.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

SECTION – B

Questions 21 to 25 carry 2 marks each.

21. Simplify: $\left[5\left(8^{\frac{1}{3}}+27^{\frac{1}{3}}\right)^3\right]^{\frac{1}{4}}$

OR

Simplify: $\sqrt[4]{81}-8\sqrt[3]{216}+15\sqrt[5]{32}+\sqrt{225}$

22. Without plotting the points indicate the quadrant in which they will lie, if
(i) ordinate is 5 and abscissa is – 3
(ii) abscissa is – 5 and ordinate is – 3
(iii) abscissa is – 5 and ordinate is 3
(iv) ordinate is 5 and abscissa is 3

23. If $\angle 1 = \angle 2$, $\angle 3 = \angle 4$ and $\angle 2 = \angle 4$, what is the relation between $\angle 1$ and $\angle 2$. Give reasons for your answer.

24. How would you rewrite Euclid's fifth postulate so that it would be easier to understand?

25. The height and the slant height of a cone are 21 cm and 28 cm respectively. Find the volume of the cone.

OR

A hemispherical bowl has a radius of 3.5 cm. What would be the volume of water it would contain?

SECTION – C

Questions 26 to 31 carry 3 marks each.

26. Simplify $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}+\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ by rationalizing the denominator.

27. Factorise $x^3 - 23x^2 + 142x - 120$.

28. Find the solution of the linear equation $x + 2y = 8$ which represents a point on (i) x-axis (ii) y-axis

29. Prove that the quadrilateral formed by joining the mid-points of the sides of a quadrilateral, in order, is a parallelogram.

30. The following table gives the life times of 400 neon lamps:

Life time (in hours)	Number of Lamps
300 – 400	14
400 – 500	56
500 – 600	60
600 – 700	86
700 – 800	74
800 – 900	62
900 – 1000	48

Represent the given information with the help of a histogram.

31. A family with a monthly income of Rs 20,000 had planned the following expenditures per month under various heads: Draw a bar graph for the given below data.

Heads	Expenditure (in thousand rupees)
Grocery	4
Rent	5
Education of children	5
Medicine	2
Fuel	2
Entertainment	1
Miscellaneous	1

SECTION – D

Questions 32 to 35 carry 5 marks each.

32. A gardener has to put double fence all around a triangular field with sides 120 m, 80 m and 60 m. In the middle of each of the sides, there is a gate of width 10 m.
(i) Find the length of wire needed for fencing.
(ii) Find the cost of fencing at the rate of ₹ 6 per metre.
(iii) Find the area of triangular field.
(iv) Find the cost of levelling the ground at the rate of ₹ 10 per m2.

OR

Anurag makes a kite using red and yellow piece of paper. Red piece of paper is cut in the shape of square with diagonal 30 cm. At one of the vertex of this square, a yellow paper with the shape of an equilateral triangle of side such that $a^2 = 32\sqrt{3}$ is attached to give the shape of a kite. Find the total area of paper required to make the kite.

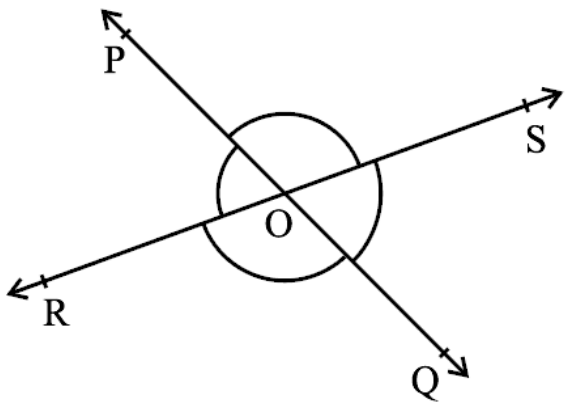
33. If $x^3 + ax^2 + bx + 6$ has $(x – 2)$ as a factor and leaves a remainder 3 when divided by $(x – 3)$, find the values of a and b.

OR

Without actual division, prove that $2x^4 – 6x^3 + 3x^2 + 3x – 2$ is exactly divisible by $x^2 – 3x + 2$.

34. A dome of a building is in the form of a hemisphere. From inside, it was white-washed at the cost of Rs 498.96. If the cost of white-washing is Rs 2.00 per square metre, find the
(i) inside surface area of the dome, (ii) volume of the air inside the dome.

35. Prove that "If two lines intersect each other, then the vertically opposite angles are equal."
Using this theorem, find all the angles if ∠ POR : ∠ ROQ = 5 : 7 in the below figure where lines PQ and RS intersect each other at point O.

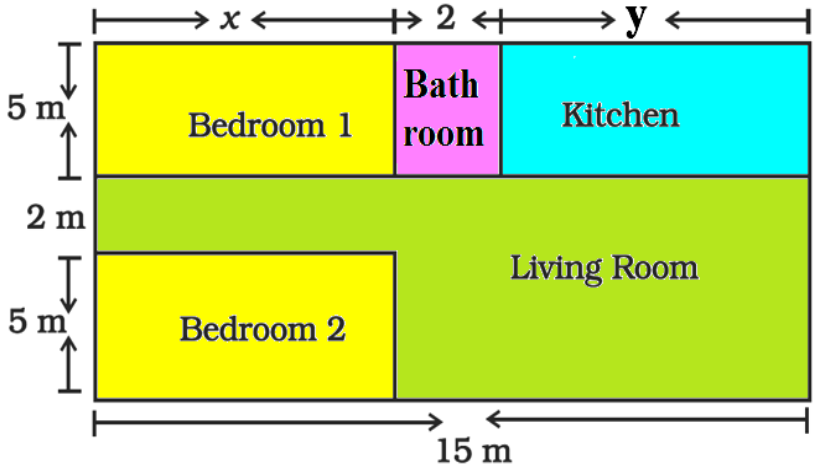


SECTION – E(Case Study Based Questions)

Questions 36 to 38 carry 4 marks each.

36. Case Study – 1

In the below given layout, the design and measurements has been made such that area of two bedrooms and Kitchen together is 95 sq. m.



(i) Form the pair of linear equation in two variables formed from the statements. [1]

(ii) Find the length of the outer boundary of the layout. [1]

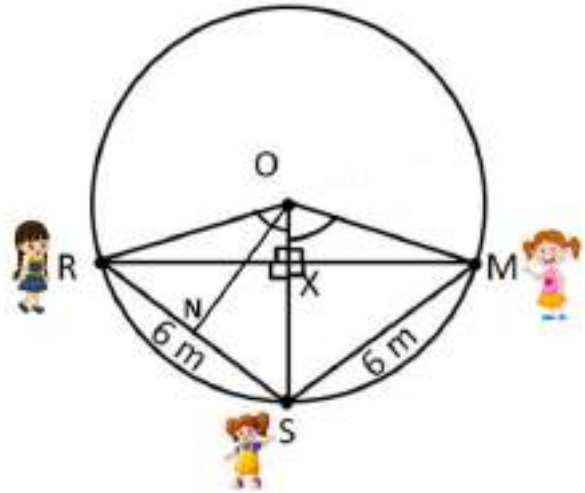
(iii) Find the area of each bedroom. [2]

OR

(iii) If the point (3, 4) lies on the graph of $3y = ax + 7$, then find the value of a.

37. Case Study – 2

Three girls Reshma, Salma and Mandip are playing a game by standing on a circle of radius 5m drawn in a park. Reshma throws a ball to Salma, Salma to Mandip, Mandip to Reshma. The distance between Reshma and Salma and between Salma and Mandip is 6m each. In the given below figure Reshma's position is denoted by R, Salma's position is denoted by S and Mandip's position is denoted by M.



(i) Find the area of triangle ORS. [2]

(ii) What is the distance between Reshma and Mandip? [2]

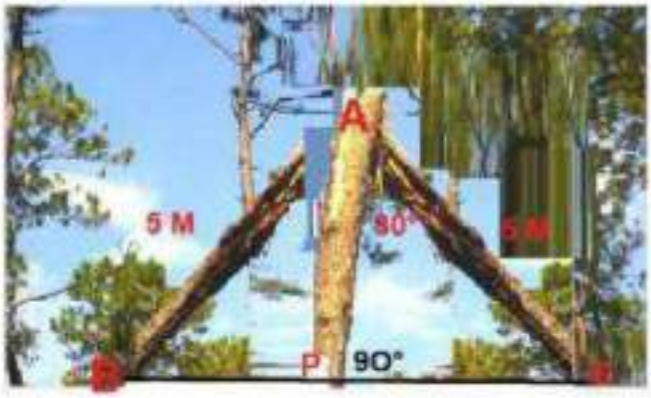
OR

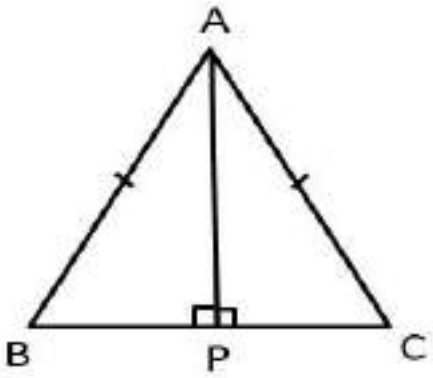
(ii) If BC is a diameter of a circle of centre O and OD is perpendicular to the chord AB of a circle, show that CA = 2OD. [2]

38. Case Study – 3

In a forest, a big tree got broken due to heavy rain and wind. Due to this rain the big branches AB and AC with lengths 5m fell down on the ground. Branch AC makes an angle of 30° with

the main tree AP. The distance of Point B from P is 4 m. You can observe that ΔABP is congruent to ΔACP.





(i) Show that ΔACP and ΔABP are congruent.
(ii) Find the value of ∠ACP?

OR

What is the total height of the tree?
(iii) Find the value of ∠BAP?

PRE BOARD - 1 (2024 - 25)

NAME OF THE STUDENT: _____ **ROLL NUMBER.: ____**

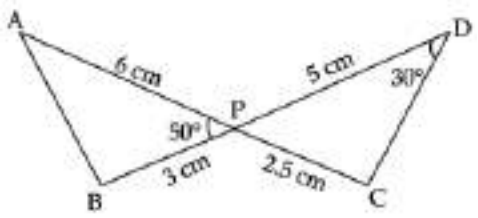
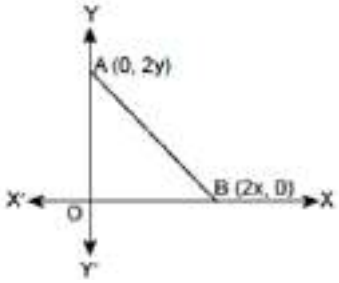
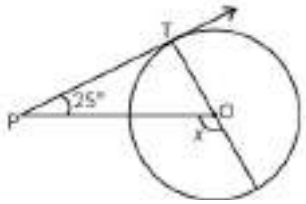
CLASS: 10 / SEC: **DATE:21/11/2024** **TIME: 3 Hours**

SUBJECT: MATHEMATICS **MARKS: 80**

General Instructions:

1. This Question Paper has 5 Sections A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub- parts of the values of 1, 2 and 1 marks each respectively.
7. All questions are compulsory. However, an internal choice in 2 Questions of 5 marks, 2 Questions of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

No	QUESTIONS	Marks
	SECTION A	
1.	In a formula racing competition, the time taken by two racing cars A and B to complete 1 round of the track is 30 minutes and p minutes respectively. If the cars meet again at the starting point for the first time after 90 minutes and the HCF (30, p) = 15, then the value of p is: (a) 45 minutes (b) 60 minutes (c) 75 minutes (d) 180minutes	1
2.	Two lines are given to be parallel. The equation of one of the lines is $3x - 2y = 5$. The equation of the second line can be: (a) $9x + 8y = 7$ (b) $-12x - 8y = 7$ (c) $-12x + 8y = 7$ (d) $12x + 8y = 7$	1
3.	What is the value of 'k' such that the following pair of equations has infinitely many solutions? $x - 2y = 3$ and $-3x + ky = -9$. (a) -6 (b) -3 (c) 3 (d) 64	1
4.	The common difference of an A.P., whose nth term is $a_n = 3n + 7$ is: (a) 3 (b) 7 (c) 10 (d) 6	1

5.	If in two triangles DEF and PQR, $\angle D = \angle Q$ and $\angle R = \angle E$, then $\frac{DE}{QR} = \frac{DF}{PQ} =$ (a) $\frac{EF}{PR}$ (b) $\frac{DP}{PQ}$ (c) $\frac{EF}{PQ}$ (d) $\frac{FQ}{QR}$	1
6.	In the figure given below, two line segments AC and BD intersect each other at the point P such that PA = 6 cm, PB = 3 cm, PC = 2.5 cm, PD = 5 cm, $\angle APB = 50°$ and $\angle CDP = 30°$. Then, $\angle PBA$ is equal to: (a) 50° (b) 30° (c) 60° (d) 100° 	1
7.	Three vertices of a parallelogram ABCD are A(1, 4), B(–2, 3) and C(5, 8). The ordinate of the fourth vertex D is (a) 8 (b) 9 (c) 7 (d) 6	1
8.	The coordinates of the point which is equidistant from the three vertices of the ΔAOB as shown in the figure is (a) (x, y) (b) (y, x) (c) (-x,-y) (d) (-x, y) 	1
9.	In ABC right angled at B, sin A = $\frac{7}{5}$ then the value of cos C is (a) $\frac{7}{5}$ (b) $\frac{24}{5}$ (c) $\frac{7}{524}$ (d) $\frac{177}{5}$	1
10	If sin 2A = $\frac{1}{2}$ tan² 45° where A is an acute angle, then the value of A is (a) 60° (b) 45° (c) 30° (d) 15°	1
11	In the given figure, PT is a tangent at T to the circle with centre O. If $\angle TPO = 25°$, then x is equal to: (a) 25° (b) 65° (c) 90° (d) 115° 	1
12	The minute hand of a clock is 84 cm long. The distance covered by the tip of minute hand from 10:10 am to 10:25 am is: (a) 44 cm (b) 88 cm (c) 132 cm (d) 176 cm	1
13	The radius (in cm) of the largest right circular cone that can be cut out from a cube of edge 4.2 cm is (a) 4.2cm (b) 2.1cm (c) 8.1cm (d) 1.05cm	1
14	The radii of two cylinders are in the ratio 2:3 and their heights are in the ratio 5:3. The ratio of their volumes is (a) 3: 4 (b) 5 : 3 (c) 27 : 20 (d) 20 : 27	1
15	The mean and mode of a frequency distribution are 28 and 16 respectively. The median is (a) 22 (b) 23.5 (c) 24 (d) 24.5	1

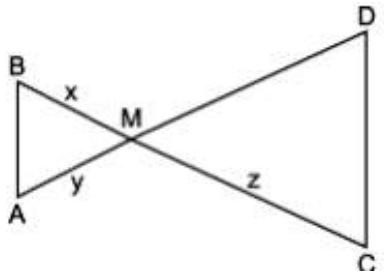
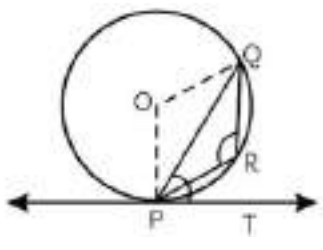
16	If the probability of an event is p, the probability of its complementary event will be: (a) p – 1 (b) p (c) 1 – p (d) $1 - \frac{1}{P}$	1
17	A bag has 5 white marbles, 8 red marbles and 4 purple marbles. If we take a marble randomly, then what is the probability of not getting purple marble? (a) 0.5 (b) 0.66 (c) 0.08 (d) 0.77	1
18	Zeroes of a polynomial p(x) can be determined graphically. No. of zeroes of a polynomial is equal to no. of points where the graph of polynomial (a) intersects y-axis (b) intersects x-axis (c) intersects y-axis or intersects x-axis (d) intersects origin.	1

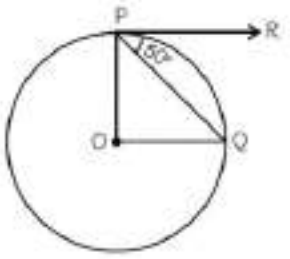
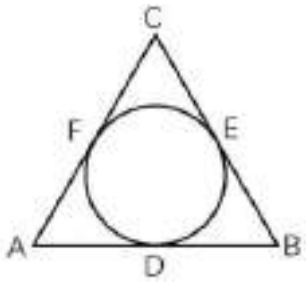
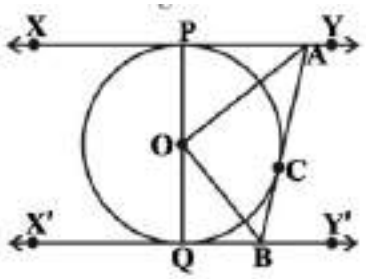
For questions 19 and 20, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
c) Assertion (A) is true but reason (R) is false.
d) Assertion (A) is false but reason (R) is true.

19.	Assertion (A): 5x + 2 is a linear polynomial. Reason (R): A polynomial of degree 1 is a linear polynomial.	1
20.	Assertion (A): The equation $x^2 + 3x + 1 = (x - 2)^2$ is a quadratic equation. Reason (R): Any equation of the form $ax^2 + bx + c = 0$ where $a \neq 0$, is called a quadratic equation.	1

SECTION B

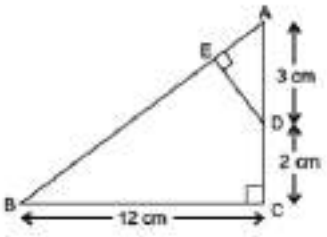
21.	Two numbers are in the ratio 2:3 and their LCM is 180. What is the HCF of these numbers?	2
22.	If one root of the quadratic polynomial $2x^2 - 3x + p$ is 3, find the other root. Also, find the value of p. **(OR)** If the product of the zeroes of the polynomial $ax^2 - 6x - 6$ is 4, then find the value of a. Also find the sum of zeroes of the polynomial.	2
23.	In the given figure, ΔAMB ~ ΔCMD. Determine MD in terms of x, y and z. 	2
24.	Evaluate: $3\cos^2 60° \sec^2 30° - 2 \sin^2 30° \tan^2 60°$.	2
25.	In figure, PQ is a chord of a circle with centre O and PT is a tangent. If ∠QPT = 60°, find ∠PRQ. 	2

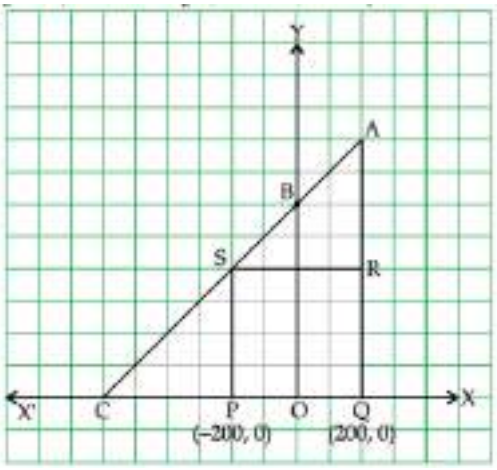
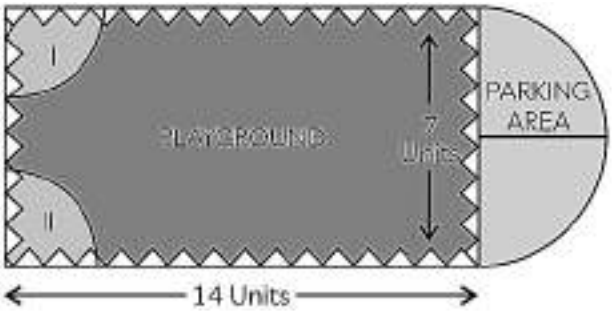
	(OR) In the figure, if O is centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 50° with PQ, find ∠POQ. 	
	SECTION C	
26.	4 bells toll together at 9.00 am. They toll after 7, 8, 11 and 12 seconds respectively. How many times will they toll together again in the next 3 hours?	3
27.	The age of the father is twice the sum of the ages of his two children. After 20 years, his age will be equal to the sum of the ages of the children. Find the age of the father.	3
28.	If $\sin\theta + \cos\theta = \sqrt{3}$, then prove that $\tan\theta + \cot\theta = 1$ **(OR)** Prove that: $\frac{\cos^2\theta}{1-\tan\theta} + \frac{\sin^2\theta}{1-\cot\theta} = 1 + \sin\theta\cos\theta$	3
29.	In the figure, a circle is inscribed in a ΔABC, such that it touches the sides AB, BC and CA at points D, E and F respectively. If the lengths of sides AB, BC and CA are 12 cm, 8 cm and 10 cm respectively, find the length of AD, BE and CF. Ans. Given, A circle inscribed in a ΔABC, such that it touches the sides AB, BC and CA at points D, E and F respectively.  **(OR)** In the below figure, XY and X′Y′ are two parallel tangents to a circle with center O and another tangent AB with point of contact C intersecting XY at A and X′Y′ at B. Prove that ∠AOB = 90°. 	3
30.	From a solid cube of side 7 cm, a conical cavity of height 7 cm and radius 3 cm is hollowed out. Find the volume of the remaining solid.	3
31.	Two dice are thrown at the same time. What is the probability that the sum of the two numbers appearing on the top of the dice is (i) at least 9? (ii) 7? (iii) less than or equal to 6?	3
	SECTION D	
32.	At a point A, 20 metres above the level of water in a lake, the angle of elevation of a cloud is 30°. The angle of depression of the reflection of the cloud in the lake, at A is 60°. Find the distance of the cloud from A. **(OR)**	5

	A man rowing a boat away from a lighthouse 150 m high takes 2 minutes to change the angle of elevation of the top of lighthouse from 45° to 30°. Find the speed of the boat. (Use $\sqrt{3}$ = 1.732)	
33.	Daily wages of 110 workers, obtained in a survey, are tabulated below. Compute the mean daily wages and modal daily wages of these workers**.** **(OR)** The distribution below gives the makes of 100 students of a class, if the median makes are 24, find the frequencies f_1 and f_2.	5
34.	In a class test, the sum of Arun's marks in Hindi and English is 30. When he got 2 marks more in Hindi and 3 marks less in English, the product of the marks would have been 210. Find his marks in the two subjects.	5
35.	a) In figure, ΔABC is right angled at C and DE ⊥ AB. Prove that ΔABC ~ ΔADE and hence find the lengths of AE and DE. b) A vertical pole of a length 6 m casts a shadow 4m long on the ground and at the same time a tower casts a shadow 28 m long. Find the height of the tower.	5
	SECTION E	
36.	A school auditorium has to be constructed with a capacity of 2000 people. The chairs in the auditorium are arranged in a concave shape facing towards the stage in such a way that each succeeding row has 5 seats more than the previous one. (a) If the first row has 15 seats, then how many seats will be there in 12th row? (b) If there are 15 rows in the auditorium, then how many seats will be there in the middle row? **(OR)** If total 1875 guests were there in the auditorium for a particular event, then how many rows will be needed to make all of them sit? (c) If total 1250 guests were there in the auditorium for a particular event, then how many rows will be left blank out of total 30 rows?	1 2 1

Daily wages (in Rs)	100 - 120	120 - 140	140 - 160	160 - 180	180 - 200	200 - 220	220 - 240
Number of workers	10	15	20	22	18	12	13

Marks	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
No. of students	4	6	10	f_1	25	f_2	18	5



37.	Jagdhish has a field which is in the shape of a right angled triangle AQC. He wants to leave a space in the form of a square PQRS inside the field from growing wheat and the remaining for growing vegetables (as shown in the figure). In the field, there is a pole marked as O. Based on the above information, answer the following questions: (a) Taking O as origin, coordinates of P are (–200, 0) and of Q are (200, 0). PQRS being a square, what are the coordinates of R and S? (b) What is the area of square PQRS? **(OR)** What is the length of diagonal PR in square PQRS? (c) If S divides CA in the ratio K: 1, what is the value of K, where point A is (200, 800)?	 1 2 1
38.	Governing council of a local public development authority of Dehradun decided to build an adventurous playground on the top of a hill, which will have adequate space for parking. After survey, it was decided to build rectangular playground, with a semi–circular area allotted for parking at one end of the playground. The length and breadth of the rectangular playground are 14 units and 7 units, respectively. There are two quadrants of radius 2 units on one side for special seats. Based on the above information, answer the following questions: (a) What is the total perimeter of the parking area? (b) What is the total area of parking and the two quadrants? **(OR)** What is the ratio of area of playground to the area of parking area? (c) Find the cost of fencing the playground and parking area at the rate of ₹2 per unit.	 1 2 1

SECTION A

*(Question numbers 01 to 20 carry **1 mark** each.)*

*Followings are **multiple choice questions**. Select the correct option in each one of them.*

01. If the sum of the zeroes of the quadratic polynomial $kx^2 + 4x + 3k$ is equal to their product, then the value of k is

(a) $-\frac{3}{4}$ (b) $\frac{3}{4}$ (c) $\frac{4}{3}$ (d) $-\frac{4}{3}$

02. The zeroes of the quadratic polynomial $x^2 + 99x + 127$ are

(a) both positive (b) both negative

(c) one positive and one negative (d) both equal

03. For what value of p, do the linear equations given by $-3x + 5y = 7$ and $2px - 3y = 1$ represent intersecting this?

(a) all real values of p except $\frac{9}{10}$ (b) all real values of p

(c) all real values of p except $\frac{10}{9}$ (d) none of these

04. If the point (x, y) is equidistant from the point $(2, 1)$ and $(1, -2)$, then

(a) $x + 3y = 0$ (b) $3x + y = 0$ (c) $x + 2y = 0$ (d) $3x + 2y = 0$

05. Area of the triangle formed by the points $(0, 0)$, $(3, 0)$ and $(0, 4)$ are

(a) 6 sq. units (b) 12 sq. units (c) 3 sq. units (d) 24 sq. units

06. The value of $(1 - \tan\theta + \sec\theta)(1 - \cot\theta + \operatorname{cosec}\theta)$ is

(a) 1 (b) -1 (c) -2 (d) 2

07. If $\sin\theta = \sqrt{3}\cos\theta$, $0° < \theta < 90°$, then θ is equal to

(a) $30°$ (b) $45°$ (c) $60°$ (d) $90°$

08. A girl calculates that the probability of her winning the first prize is a lottery is 0.08. If 6000 tickets are sold, how many tickets has she bought?

(a) 40 (b) 240 (c) 480 (d) 750

09. In a family of 3 children, the probability of having at least one boy is

(a) $\frac{7}{8}$ (b) $\frac{1}{8}$ (c) $\frac{5}{8}$ (d) $\frac{3}{4}$

10. If every term of the statistical data consisting of 'n' terms is decreased by 3, then the mean of the data

(a) remains unchanged (b) decreased by 3n

(c) decreased by 1 (d) decreased by 3

11. If the mean and mode of a distribution are 15 and 18 respectively, then the median of this distribution is

(a) 17 (b) 15 (c) 16 (d) 18

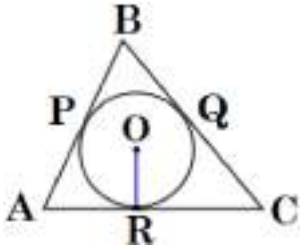
12. The volume of a right-circular cone whose area of the base is 156 cm^2 and the vertical height is 8 cm, is given by

(a) 2496 cm^3 (b) 1248 cm^3 (c) 1664 cm^3 (d) 416 cm^3

13. A hollow cube of internal edge 22 cm is filled with spherical marble of diameter 0.5 cm and it is assumed that $\frac{1}{8}$ space of the cube remains unfilled. Then the number of marbles that the cube can accommodate

(a) 142296 (b) 142396 (c) 142496 (d) 142596

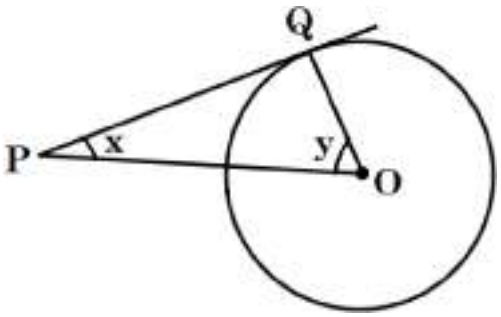
14. In the given figure $AB = BC = 10$ cm. If $AC = 7$ cm, then the length of BP is



(a) 3.5 cm (b) 7 cm
(c) 6.5 cm (d) 5 cm

15. In the given figure, PQ is tangent to the circle with cente O. If $\angle OPQ = x$, $\angle POQ = y$, then $(x + y)$ is

(a) 45° (b) 90°
(c) 60° (d) 180°



16. From an external point Q, the length of the tangent to a circle is 5 cm and the distance of Q from the centre is 8 cm. The radius of the circle is

(a) 39 cm (b) 3 cm (c) $\sqrt{39}$ cm (d) 7 cm

17. The roots of the equation $x^2 + 3x - 10 = 0$ are

(a) $2, -5$ (b) $-2, 5$ (c) $2, 5$ (d) $-2, -5$

18. In an A.P. $a_1, a_2, a_3, ..., a_{n-1}, a_n$, we are given that $a_1 + a_n = x$. Then $(a_4 + a_{n-3}) =$

(a) 2x (b) $\frac{x}{2}$ (c) x (d) Data insufficient

*Followings are **Assertion-Reason based questions**.*

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

19. **Assertion (A) :** 2 is a prime number.
Reason (R) : The square of an irrational number is always a prime number.

20. **Assertion (A) :** If the circumference of a circle is 176 cm, then its radius is 28 cm.
Reason (R) : Circumference $= 2\pi \times$ radius of a circle.

SECTION B

*(Question numbers 21 to 25 carry **2 marks** each.)*

21. Find the greatest number which divides 430, 1314 and 1331 leaving remainder 5 in each case.

OR

Two numbers are in the ratio $2:3$ and their LCM is 180. What is the HCF of these numbers?

22. A boy contains 15 white and some black balls. If the probability of drawing a black ball from the bag is thrice that of drawing a white ball, find the number of black balls in the bag.

23. Prove that $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$.

OR

If $\sin\theta - \cos\theta = 0$, then find the value of $\sin^4\theta + \cos^4\theta$.

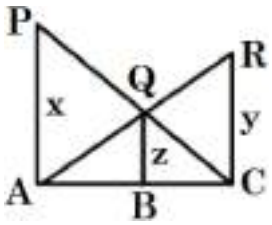
24. If the distance of $P(x, y)$ from $A(5, 1)$ and $B(-1, 5)$ are equal, then find $x:y$.

25. Find the ratio in which the line segment joining $A(1, -5)$ and $B(-4, 5)$ is divided by the x-axis.

SECTION C

*(Question numbers 26 to 31 carry **3 marks** each.)*

26. In the figure, PA, QB and RC are each perpendicular to AC. If $PA = x$ units, $RC = y$ units and $QB = z$ units, prove that $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$.



OR

Sides AB and BC and median AD of a triangle ABC are respectively proportional to sides PQ and QR and median PM of ΔPQR. Show that $\Delta ABC \sim \Delta PQR$.

27. Using quadratic formula, solve : $p^2x^2 + (p^2 - q^2)x - q^2 = 0$.

28. Prove that $2 + \sqrt{3}$ is irrational, given that $\sqrt{3}$ is an irrational number.

29. Prove that $\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \text{cosec}\, A + \cot A$.

30. Determine the area of the minor segment of a circle of radius 14 cm, when the angle of the corresponding sector is $60°$.

OR

A semicircle MON is inscribed in another semicircle. Radius OL of the larger semicircle is 6 cm. Find the area of the shaded segment in terms of π. Draw rough figure and show your steps.

31. If α and β are the zeroes of quadratic polynomial $f(t) = t^2 - p(t+1) - C$, then show that $(\alpha+1)(\beta+1) = 1 - C$.

SECTION D

*(Question numbers 32 to 35 carry **5 marks** each.)*

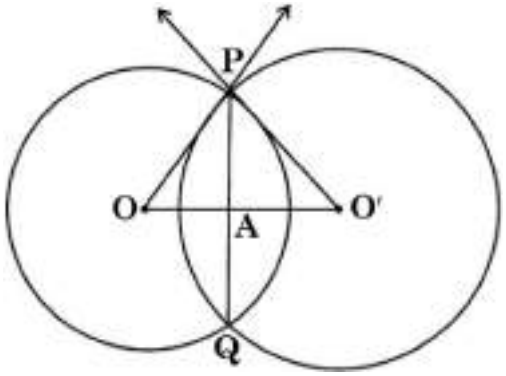
32. A train covered a certain distance at a uniform speed. If the train would have been 6 km/h faster, it would have taken 4 hours less than the scheduled time and if the train were slower by 6 km/h, it would have taken 6 hours more than the scheduled time. Find the length of the journey.

OR

A boat goes 30 km upstream and 44 km downstream in 10 hours. In 13 hours, it can go 40 km upstream and 55 km downstream. Determine the speed of the stream and that of the boat in still water.

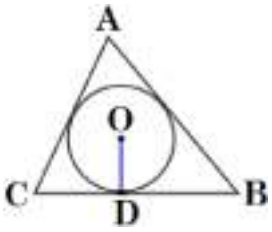
33. Two circles with centres O and O′ of radii 6 cm and 8 cm, respectively intersect at two points P and Q such that OP and O′P are tangents to the two circles.

Find the length of the common chord PQ (in cm).



OR

A triangle ABC is drawn to circumscribe a circle of radius 4 cm such that the segment BD and DC are of lengths 10 cm and 8 cm respectively. Find the lengths of the sides AB and AC, if it is given that area $\Delta ABC = 90\ cm^2$.



34. The angle of elevation of an airplane from point A on the ground is $60°$. After a flight of 10 seconds, on the same height, the angle of elevation from point A becomes $30°$. If the airplane is flying at the speed of 720 km/h, find the constant height at which the airplane is flying.

35. The median of the following data is 50.
Find the values of p and q, if the sum of all frequencies is 90. Also find the mode.

Marks obtained	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Number of students	p	15	25	20	q	8	10

SECTION E

*(Question numbers 36 to 38 carry **4 marks** each.)*
*This section contains **three Case-study / Passage based questions**.*
*Each question has **three sub-parts** (i), (ii) and (iii). Two sub-parts are of **1 mark each** while the remaining third sub-part (with internal choice) is of **2 marks**.*

36. Treasure Hunt is an exciting and adventurous game where participants follow a series of clues / numbers / maps to discover hidden treasures. Players engage in a thrilling quest, solving puzzle and riddles to unveil the location of the coveted prize.

While playing a treasure hunt game, some clues (numbers) are hidden in various spots collectively forming an A.P.

If the number on the n^{th} spot is $20 + 4n$, then answer the following questions to help the players in spotting the clues.

(i) Which number is on first spot?

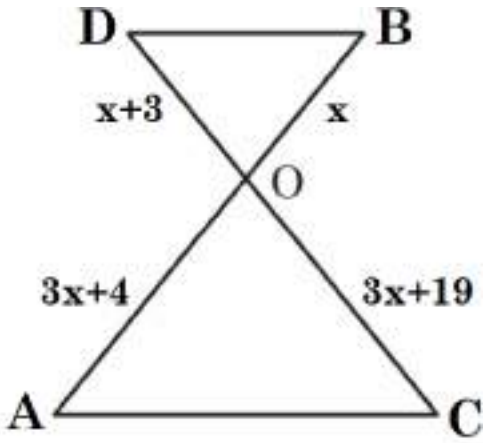
(ii) Which number is on the $(n-2)^{th}$ spot?

(iii) Which spot is numbered as 112?

OR

(iii) What is the sum of all the numbers on the first 10 spots?

37. In the figure given below, a folding table is shown.



The legs of the table are represented by line segments AB and CD intersecting at O.
Join AC and BD.
Considering that the table top is parallel to the ground, and $OB = x$, $OD = x + 3$, $OC = 3x + 19$ and $OA = 3x + 4$, answer the following questions.

(i) Prove that ΔOAC is similar to ΔOBD.

(ii) Prove that $\frac{OA}{AC} = \frac{OB}{BD}$.

(iii) Observe the figure and find the value of x. Hence, find the length of OC.

OR

(iii) Observe the figure and find $\frac{BD}{AC}$.

38. A wooden toy is shown in the picture. This is a cuboidal wooden block of dimensions $14\text{ cm} \times 17\text{ cm} \times 4\text{ cm}$. On its top there are seven cylindrical hollows for bees to fit in. Each cylindrical hollow is of height 3 cm and radius 2 cm.

Based on the above, answer the following questions.

(i) Find the volume of wood carved out to make one cylindrical hollow.

(ii) Find the lateral surface area of the cuboid to paint it with green colour.

(iii) Find the volume of wood in the remaining cuboid after carving out seven cylindrical hollows.

OR

(iii) Find the surface area of the top surface of the cuboid to be painted yellow.

SECTION A

*(Question numbers 01 to 20 carry **1 mark** each.)*
*Followings are **multiple choice questions**. Select the correct option in each one of them.*

01. HCF and LCM of two numbers x and y are 3 and 105. If $x + y = 36$, then the value of $\frac{1}{x} + \frac{1}{y}$ is

(a) $\frac{1}{25}$ (b) $\frac{4}{35}$ (c) 35 (d) 315

02. If $x = -2$ is one of the zero of $x^2 - x - 6$, then its other zero is

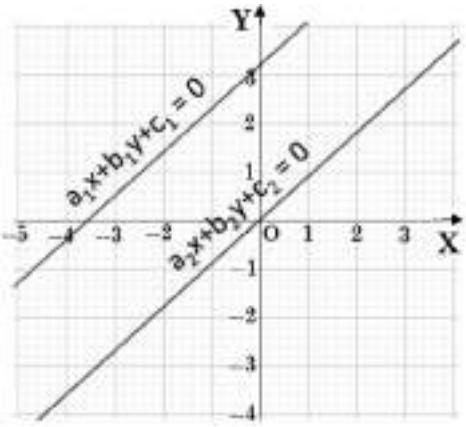
(a) -3 (b) $\frac{1}{3}$ (c) 3 (d) 2

03. The lines representing the given pair of linear equations are non-intersecting.

Which of the following statements is true?

(a) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ (b) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

(c) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$ (d) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$



04. If O is the centre of the circle and chord CD makes an angle of 70° with the tangent CP at the point of contact C, then the angle subtended by the chord at the centre is

(a) 140° (b) 100° (c) 90° (d) 40°

05. What is the ratio in which the line segment joining (2, –3) and (5, 6) is divided by x-axis?

(a) 1:2 (b) 2:1 (c) 2:5 (d) 5:2

06. The nature of roots of the equation $9x^2 - 6x - 2 = 0$ is

(a) No real roots (b) 2 equal real roots
(c) 2 distinct real roots (d) More than 2 real roots

07. The first negative term of the A.P. $\frac{81}{5}, \frac{77}{5}, \frac{73}{5}, \ldots$ is

(a) 23rd term (b) 20th term (c) 21st term (d) 22nd term

08. If $\sin 30^\circ \tan 45^\circ = \frac{\sec 60^\circ}{k}$, then the value of k is

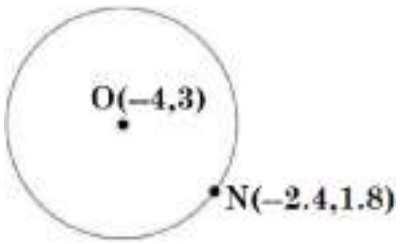
(a) 1 (b) 2 (c) 3 (d) 4

09. If in two triangles ΔDEF and ΔPQR, $\angle D = \angle Q$ and $\angle R = \angle E$, then which of the following is **not** true?

(a) $\frac{DE}{QR}=\frac{DF}{PQ}$ (b) $\frac{DE}{PQ}=\frac{EF}{RP}$ (c) $\frac{EF}{PR}=\frac{DF}{PQ}$ (d) $\frac{EF}{RP}=\frac{DE}{QR}$

10. The coordinates of the centre O of the circle and a point N on the circle are shown in the given figure.

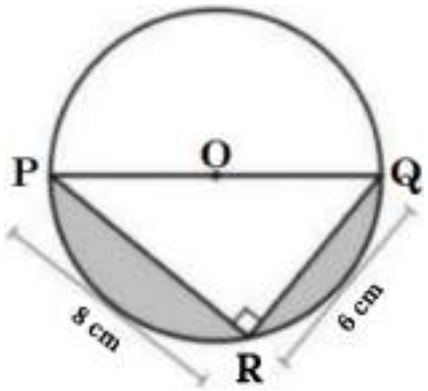
What is the radius of the circle?



(a) $\sqrt{0.4}$ units (b) 4 units

(c) 2 units (d) $\sqrt{42.4}$ units

11. In the given figure, O is the centre of the circle. PR and RQ are chords of the circle. The radius of the circle is 5 cm, $PR = 8$ cm, $QR = 6$ cm and $\angle PRQ = 90^\circ$.



What is the area (in cm^2) of the shaded region?

(a) $\left(\frac{25\pi}{4}-24\right)$ (b) $\left(\frac{25\pi}{2}-24\right)$

(c) $\left(\frac{25\pi}{4}\right)$ (d) $\left(\frac{25\pi}{2}\right)$

12. The following table shows the value of cosecant and secant of different angles.

θ	30°	60°
$\text{cosec}\,\theta$	P	1.154
$\sec\theta$	1.154	Q

Then the value of $(P+Q)$ is

(a) 0 (b) $\frac{1+\sqrt{3}}{2}$ (c) 4 (d) $2\left(1+\frac{1}{\sqrt{3}}\right)$

13. A regular pentagon is inscribed in a circle with centre O, of radius 5 cm, as shown in the given figure.

What is the area of the shaded portion of the circle?

(a) 2π cm^2 (b) 4π cm^2

(c) 5π cm^2 (d) 10π cm^2

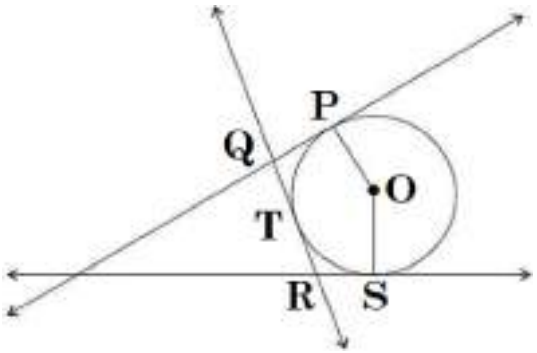
14. Which of the following cannot be obtained graphically?

(a) Mean (b) Median (c) Mode (d) None of these

15. Yash participated in a game along with his friends. His probability of winning the game is 0.07, then what is the probability of losing the game?

(a) 0.03 (b) 0.93 (c) 0.3 (d) 0.33

16. In the given figure, tangents are drawn to a circle, with centre O, at points P, T and S.



If $QR = 12$ cm and the radius of the circle is 7 cm, what is the perimeter of the polygon PQTRSO?

(a) 26 cm (b) 31 cm
(c) 38 cm (d) 45 cm

17. If $\alpha + \beta = 90^\circ$ and $\alpha = 2\beta$, then $\cos^2\alpha + \sin^2\beta$ is equal to

(a) 1 (b) $\frac{1}{2}$ (c) 0 (d) 2

18. A box contains cards numbered 6 to 50. A card is drawn at random from the box. The probability that the drawn card has a number which is either a multiple of 2 or a multiple of 5?

(a) $\frac{34}{45}$ (b) $\frac{27}{44}$ (c) $\frac{3}{5}$ (d) $\frac{34}{44}$

*Followings are **Assertion-Reason based questions**.*

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

19. Consider an A.P. 3, 9, 15, 21, ….

Assertion (A) : General term (n^{th} term) of A.P. is given by $(6n - 3)$.

Reason (R) : Sum of first n terms of the A.P. is given by $(3n^2 - 1)$.

20. **Assertion (A) :** If radius of a sphere is 'p' units, then its surface area is $(4\pi p^2)$ units^3.

Reason (R) : The volume of a right circular cylinder is 3 times the volume of right circular cone, if they have same dimensions (with the same height and the base-radius).

SECTION B

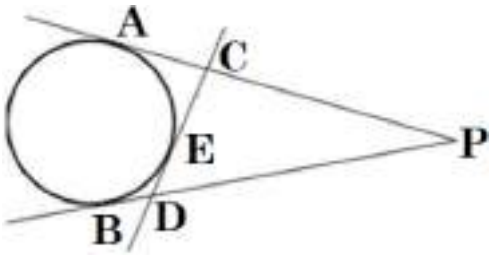
*(Question numbers 21 to 25 carry **2 marks** each.)*

21. If $\sin\theta + \cos\theta = \sqrt{3}$, then find the value of $\sin\theta.\cos\theta$.

OR

Find the value of x: $2\text{cosec}^2 30^\circ + x\sin^2 60^\circ - \frac{3}{4}\tan^2 30^\circ = 10$.

22. From an external point P, two tangents, PA and PB are drawn to a circle with centre O.



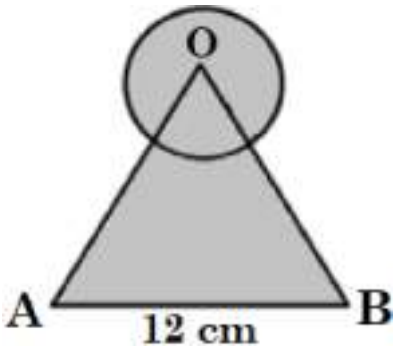
At a point E on the circle, a tangent is drawn to intersect PA and PB at C and D, respectively. If $PA = 15$ cm, then find the perimeter of ΔPCD.

23. X and Y are points on the sides PQ and PR respectively of a ΔPQR.

If $PX = 4$ cm, $XQ = 4.5$ cm, $PY = 8$ cm and $YR = 9$ cm, then show that $XY \| QR$.

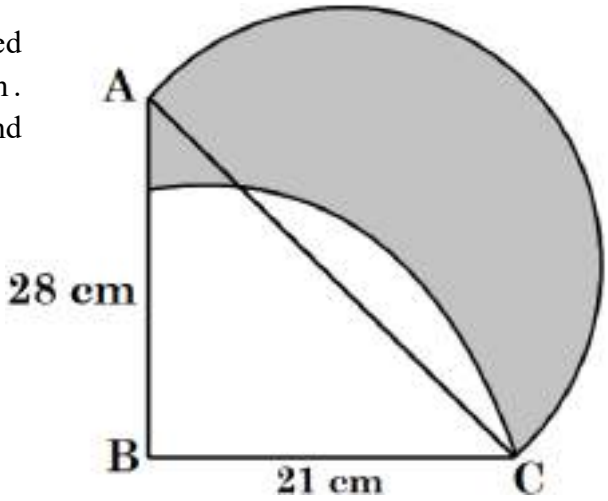
24. The LCM of two numbers is 14 times their HCF. The sum of LCM and HCF is 600. If one of the numbers is 280, then find the other number.

25. Find the area of the shaded portion in the given figure below, where a circular arc of radius 6 cm has been drawn with vertex O of an equilateral triangle OAB of side 12 cm as centre.



OR

In the given figure below, ABC is a right-angled triangle, $\angle B = 90^\circ$, $AB = 28$ cm and $BC = 21$ cm. With AC as diameter, a semi-circle is drawn and with BC as radius a quarter circle is drawn.
Find the area of the shaded region.



SECTION C

*(Question numbers 26 to 31 carry **3 marks** each.)*

26. National Art convention got registrations from students from all parts of the country, of which 65 are interested in music, 104 are interested in dance and 117 students are interested in handicrafts. For optimum cultural exchange, organizers wish to keep them in minimum number of groups such that each group consists of students interested in the same art form and the number of students in each group is the same. Find the number of students in each group. Find the number of groups in each art form. How many rooms are required if each group will be allotted a room?

27. Find the value of k, for which the pair of linear equations $kx + (k-2)y = 1$ and $3x + y = 5$ has no solutions.

OR

Two people are 16 km apart on a straight road. They start walking at the same time. If they walk towards each other with different speeds, they will meet in 2 hours. Had they walked in the same direction with the same speeds as before, they would have met in 8 hours. Find their walking speeds.

28. α and β are the zeroes of polynomial $f(x) = 2x^2 + 5x + m$. Find the value of m, such that $\alpha^2 + \beta^2 + \alpha\beta = \frac{21}{4}$.

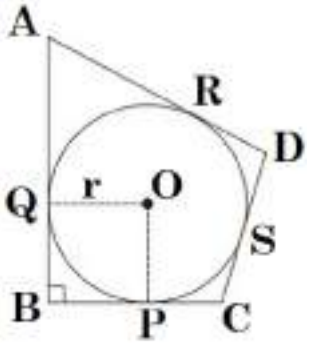
29. If $a\cos\theta + b\sin\theta = c$, then prove that $a\sin\theta - b\cos\theta = \pm\sqrt{a^2 + b^2 - c^2}$.

30. An isosceles triangle ABC is inscribed in a circle. If $AB = AC = 13$ cm and $BC = 10$ cm, find the radius of the circle.

OR

Prove that the lengths of tangents drawn from an external point to a circle are equal.
Using the above result, find the radius r of the circle.

Given that a circle is inscribed in a quadrilateral ABCD in which it is known that $\angle B = 90^\circ$, $AD = 17$ cm, $AB = 20$ cm and $DS = 3$ cm.



31. The median of the following distribution is 14.4.
Find the values of x and y, if the total frequency is 20.

Class interval	0 - 6	6 - 12	12 - 18	18 - 24	24 - 30
Frequency	4	x	5	y	1

SECTION D

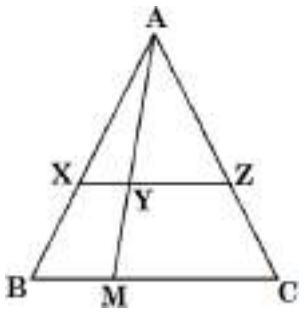
*(Question numbers 32 to 35 carry **5 marks** each.)*

32. Tanu and Manu are competing in a 60 km cycling race. Manu's average speed is 10 km/hr greater than Tanu's average speed and she finished the race in half an hour less than Tanu. Find the time taken by Tanu to finish the race.

OR

At t minutes past 2 p.m., the time needed by the minute hand of a clock to show 3 p.m. was found to be 3 minutes less than $\frac{t^2}{4}$ minutes. Find the value of t.

33. Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio.
In the adjacent figure, XZ is parallel to BC, $AZ = 3$ cm, $ZC = 2$ cm, $BM = 3$ cm, $MC = 5$ cm. Find the length of XY.



34. The height of a cone is 40 cm. A small cone is cut off at the top by a plane parallel to the base and its volume is $\frac{1}{64}$ times the volume of the original cone. Find the height from the base at which the section is made.

OR

Due to heavy floods in a state, thousands were rendered homeless. 50 schools collectively decided to provide place and the canvas for 1500 tents and share the whole expenditure equally. The lower part of each tent is cylindrical with base radius 2.8 m and height 3.5 m and the upper

part is conical with the same base radius, but of height 2.1 m. If the canvas used to make the tents costs ₹120 per m^2, find the amount shared by each school to set up the tents.

35. The mean of the following data is 50, where the frequencies f_1 and f_2 are missing. Find the missing frequencies.

Class Interval	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100	Total
Frequency	17	f_1	32	f_2	19	120

Also find the mode of the data.

SECTION E

*(Question numbers 36 to 38 carry **4 marks** each.)*

*This section contains **three Case-study / Passage based questions**.*

*Each question has **three sub-parts** (i), (ii) and (iii). Two sub-parts are of **1 mark each** while the remaining third sub-part (with internal choice) is of **2 marks**.*

36. Rohan was playing with cards and he created a structure with cards by stacking them on top of each other in the shape of pyramid. Each small triangle is made using 3 cards and each layer has 1 less triangle than the layer below it.

Based on the given information, answer the following questions.

(i) Rohan's younger brother Naman and his friends wanted to use 3 cards in the top layer and 18 in the bottom layer. Form an A.P., showing the number of cards in each layer starting from the top layer. Write the common difference of A.P.

(ii) Naman is planning to make another pyramid with the top and bottom layer containing 15 and 138 cards respectively. How many layers will such a pyramid have?

(iii) Suppose they have a total of 360 cards with them. Find the maximum number of layers that Naman can make using the cards they have, if they want to have 1 triangle i.e., 3 cards at the top layer.

OR

(iii) If the value of $t_n = 183$, find the number of cards in the middle layer.

37. An aeroplane is a vehicle with the wings and one or more engines that enable it to fly through the air.

An aeroplane flying at a height of 600 m observes the angles of depressions of opposite points on the two banks P and Q of river to be 30° and 60°.

Use the above information to answer the questions that follows.

(i) Draw a neat labeled figure to show the above situation diagrammatically.

(ii) Find the width of the river.

(iii) Find the distance of aeroplane from point P.

OR

(iii) Find the distance of aeroplane from point Q.

38. In a classroom, 2 friends Pawan and Udit are seated at the points A(–5, 3) and B(5, 3) respectively. Their friend Raja entered the classroom and want to sit on a seat C such that an equilateral triangle should be formed and the centre of the classroom O(0, 0) lies inside the triangle. Use $\sqrt{3} = 1.7$, if required.

Based on the above information, answer the following questions.

(i) Show the position of Pawan and Udit on a graph.

(ii) What is the measure of each side of the equilateral triangle so formed?

(iii) Find the coordinates of position of Raja.

OR

(iii) Show the position of Raja on the graph. Also find the area of the triangle so formed.

HUB OF LEARNING

PREPARATORY EXAMINATION - 2023-24

Hub School 1187

SUBJECT: STANDARD MATHEMATICS

Date : 18-Dec-2023
Grade : 10

Max Marks : 80
Time : 3 Hrs

General Instructions:

1. This Question Paper has 5 Sections A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks have been provided. An internal choice has been provided in the 2 marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

SECTION A

Section A consists of 20 questions of 1 mark each.

1. The HCF and LCM of two numbers are 33 and 264 respectively. When the first number is completely divided by 2 the quotient is 33. The other number is:

a) 66	b)130
c)132	d)196

2. If one of the zeroes of the quadratic polynomial $(k-1)x^2 + kx + 1$ is -3, then the value of k is

a) $\frac{4}{3}$	b) $\frac{-4}{3}$
c) $\frac{2}{3}$	d) $\frac{-2}{3}$

3. The points (7, 2) and (-1,0) lie on a line

a)7y = 3x - 7	b)4y = x + 1
c)y = 4y + 1	d)x = 4y + 1

The roots of the equation $9x^2 - bx + 81 = 0$ will be equal, if the value of b is

a) ±9	b) ±18
c) ±27	d) ±54

5. If the sum of three numbers in an A.P. is 9 and their product is 24, then numbers are

a) 2, 4, 6	b) 1, 5, 3
c) 2, 8, 4	d) 2, 3, 4

6. In what ratio of line $x - y - 2 = 0$ divides the line segment joining (3, –1) and (8, 9)?

a) 1 : 2	b)2 : 1
c) 2 : 3	d)1 : 3

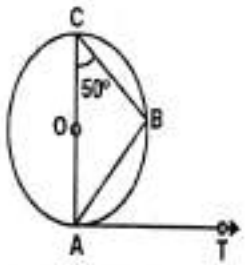
7. If the distance between the points A(2, -2) and B(-1, x) is equal to 5, then the value of x is:

a)2	b)-2
c)1	d)-1

8 The lengths of the diagonals of a rhombus are 16 cm and 12cm. Then, the length of the side of the rhombus is

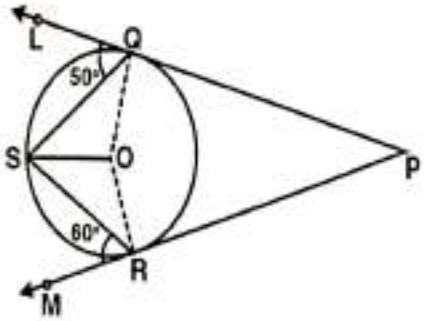
a)9cm	b)10cm
c)8cm	d)20cm

9 AB is a chord of the circle and ∠AOC is its diameter such that angle ∠ACB = 50°. If AT is the tangent to the circle at the point A, then ∠BAT is equal to



a)65°	b)60°
c) 50°	d)40°

10. In the figure, PQL and PRM are tangents to the circle with centre O at the points Q and R, respectively and S is a point on the circle such that ∠SQL = 50° and ∠SRM = 60°. Then ∠QSR is equal to



	a)40°	b)60°
	c)70°	d)80°

11. Given that $\cos\theta = \frac{b}{a}$, then $\sin\theta$ is

a)$\frac{\sqrt{a^2-b^2}}{b}$	b)$\frac{\sqrt{a^2-b^2}}{a}$
c)$\frac{b}{\sqrt{a^2-b^2}}$	d)$\frac{a}{\sqrt{a^2-b^2}}$

12. (cosec A + cot A)(1 - cos A) equals:

a)cosec A	b)sec A
c)cos A	d)sin A

13 If a tower 6m high casts a shadow of $2\sqrt{3}$m long on the ground, then the sun's elevation is:

a)60°	b)45°
c)30°	d)90°

14. The largest triangle inscribed in a semicircle of radius r, then the area of that triangle is:

a)r^2	b)$\frac{1}{r^2}$
c)$2r^2$	d)$\sqrt{2}\,r^2$

15. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. The length of the arc is:

a)20cm	b)21cm
c)22cm	d)25cm

16. The probability of a leap year selected at random contain 53 Sunday is:

a) 3/7	b)1/7
c)2/7	d)4/7

17. 2 Black kings, 2 Red queens and an Ace of spade is removed from a pack of 52 cards.A card is drawn at random from the remaining pack. What is the probability of getting a black card?

a)$\frac{23}{47}$	b)$\frac{23}{52}$
c)$\frac{26}{47}$	d)$\frac{26}{52}$

18 If the mean of frequency distribution is 7.5 and $\sum fi\,xi = 120 + 3k$, $\sum fi = 30$, then k is equal to:

a)40	b)35
c)50	d)55

19. DIRECTION: In question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option

Statement A (Assertion):If the height of the cone is 24 cm and diameter of the base is 14cm , then the slant height of the cone is 15 cm.

Statement R (Reason) : If r is the radius and h the height of the cone the slant height is $h^2 + r^2$

a)Both assertion (A) and reason (R) are	b)Both assertion (A) and reason (R) are

	true and reason (R) is the correct explanation of assertion (A)	true and reason (R) is not the correct explanation of assertion (A)
	c) Assertion (A) is true but reason (R) is false.	d)Assertion (A) is false but reason (R) is true

20. Statement A (Assertion):Let the positive numbers a,b,c be in A.P, then $\frac{1}{bc}, \frac{1}{ac}, \frac{1}{ab}$ are also in A.P

Statement R (Reason) :If each term of an A.P is divided by abc, then the resulting sequence is also in A.P

a)Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)	b)Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
c) Assertion (A) is true but reason (R) is false.	d)Assertion (A) is false but reason (R) is true

SECTION B

Section B consists of 5 questions of 2 marks each.

21 The length, breadth and height of a room are 8 m 50 cm,6 m 25 cm and 4 m 75 cm respectively. Find the length of the longest rod that can measure the dimensions of the room exactly.

22 If $\sin\theta + \cos\theta = \sqrt{3}$, prove that $\tan\theta + \cot\theta = 1$

or

Evaluate: $2\tan^2 45° + \cos^2 30° - \sin^2 60°$

23 Prove that the parallelogram circumscribing a circle is a rhombus.

24 A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding:

(i) minor segment

(ii) major sector. (Use $\pi = 3.14$)

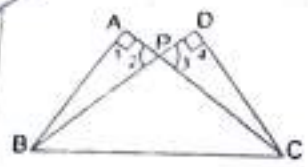
or

In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find:

(i) the length of the arc

(ii) area of the sector formed by the arc

25. In the figure ABC and DBC are two right triangles. Prove that AP × PC = BP × PD.



SECTION C

Section C consists of 6 questions of 3 marks each

26. Prove that $3 - 2\sqrt{5}$ is irrational. Given that $\sqrt{5}$ is irrational.

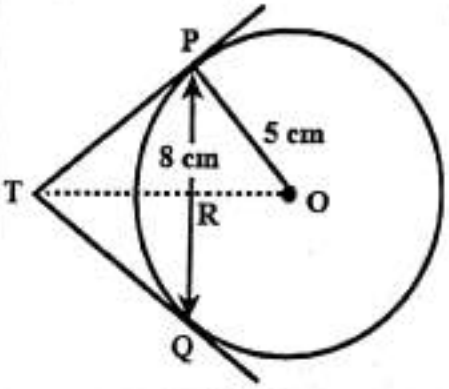
27. If α and β are the zeros of the polynomial $6y^2 - 7y + 2$, find a quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

28. Places A and B are 80 km apart from each other on a highway. A car starts from A and another from B at the same time. If they move in the same direction they meet in 8 hours and if they move towards each other they meet in 1 hour 20 minutes. Find the speed of cars.

[or]

Sumit is 3 times as old as his son.five years later, he shall be two and a half times as old as his son. How old is sumit at present?

29. In the given figure, PQ is a chord of length 8 cm of a circle of radius 5 cm. The tangents at P and Q intersect at a point T. Find the length TP.



30. Prove that $\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \text{cosec } A + \cot A$

[or]

Prove that $2(\sin^6 A + \cos^6 A) - 3(\sin^4 A + \cos^4 A) + 1 = 0$

31. A class teacher has the following absentee record of 40 students of a class for the whole team. Find the mean number of days a student was absent.

No. of days	0-6	6-12	12-18	18-24	24-30	30-36	36-42
No. of students	10	11	7	4	4	3	1

SECTION D

Section D consists of 4 questions of 5 marks each

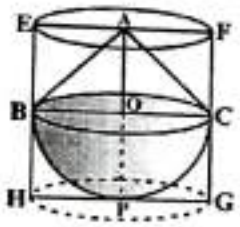
32. In a flight of 600 km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km/h from its usual speed and time of flight increased by 30 minutes. Find the scheduled duration of flight.

[or]

To fill a swimming pool two pipes are used. If the pipe of larger diameter used for 4 hours and the pipe of smaller diameter for 9 hours, only half of the pool can be filled. Find how long it would take for each pipe to fill the pool separately, if the pipe of smaller diameter takes 10 hours more than the pipe of larger diameter to fill the pool?

33. State and prove converse of Basic Proportionality theorem.

34. A solid toy is in the form of a hemisphere surmounted by a right circular cone. he height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. If a right circular cylinder circumscribes the toy, find the differences of the volumes of the cylinder and toy.(Take $\pi = 3.14$)



[or]

A gulab jamun contains sugar syrup up to about 30% of its volume.Find approximately how much syrup would be found in 45 gulab jamuns, each shaped like a cylinder with two hemispherical ends with lengths 5 cm and diameter 2.8 cm.

35. The median of the following data is 32. Find the values of 'x' and 'y', if the sum of all frequencies is 50. Also find the mode of the data.

C.I	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60
Frequency	10	7	x	5	y	6

SECTION E

36. India is a competitive manufacturing location due to the low cost of manpower and strong technical and engineering capabilities contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by a fixed number every year. It

produced 16000 sets in the 6th year and 22600 in 9th year.

1. Find the production during first year

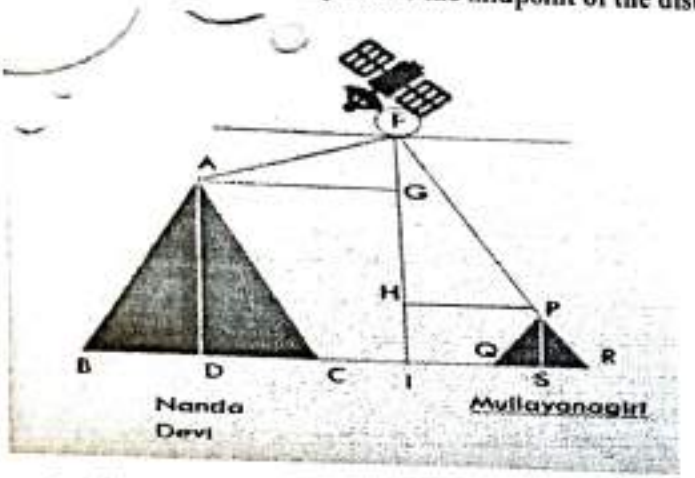
   [or]

   In which year, the production is 29,200.

2. Find the production during 8th year. 2

3. Find the production during the first 3 years. 1

37. A satellite flying at height h is watching the top of the two tallest mountains in uttarakhand and karnataka ,them being nanda devi(height 7,816m) and mullayanagiri (height 1,930 m). the angles of depression from the satellite , to the top of nanda devi and mullayanagiri are 30° and 60° respectively. if the distance between the peaks of two mountains is 1937 km , and the satellite is vertically above the midpoint of the distance between the two mountains. 1



1. Find the distance of the satellite from the top of Nanda Devi. 1
2. Find the distance of the satellite from the top of Mullayanagiri.

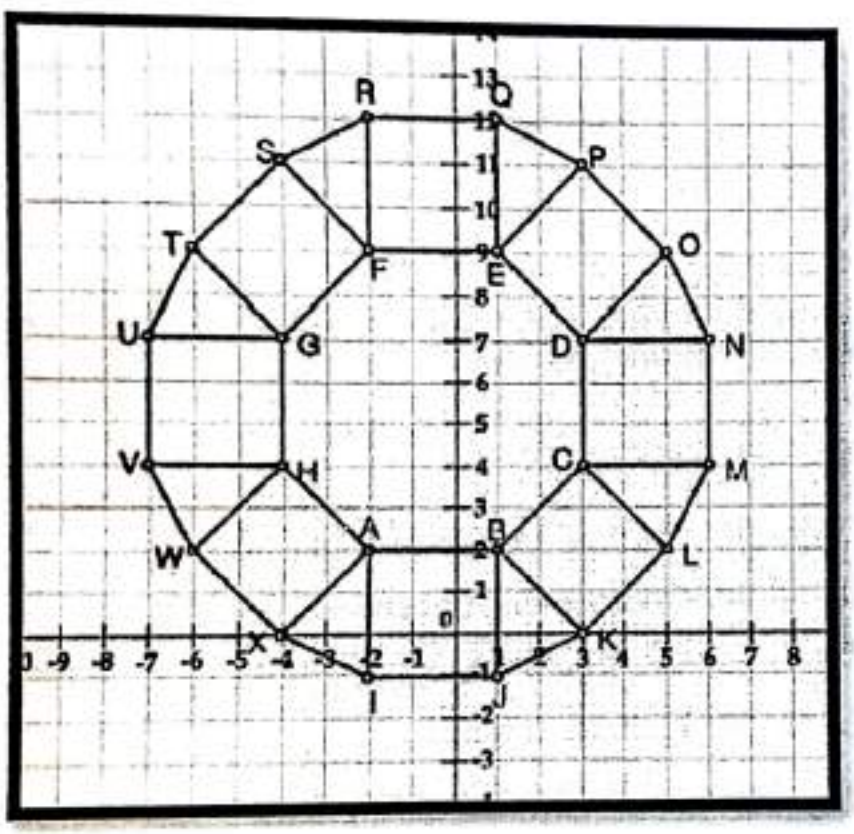
   [or]

   Find the distance of the satellite from the ground 2
3. What is the angle of elevation if a man is standing at a distance of 7816 m from Nanda Devi?

   1

38. A tiling or tessellation of a flat surface is the covering of a plane using one or more geometric shapes, called tiles, with no overlaps and no gaps. Historically, tessellations were used in ancient Rome and in Islamic art. You may find tessellation patterns on floors, walls, paintings etc. shown below is a tiled floor in the archaeological museum of Seville, made using squares, triangles and hexagons.

A craftsman thought of making a floor pattern after being inspired by the above design. To ensure accuracy in his work, he made the pattern on the Cartesian plane. He used regular octagons, squares and triangles for his floor tessellation pattern.



1. What is the length of the line segment joining points B and F? 1
2. What are the coordinates of the point on y axis equidistant from A and G?

   [or]

   What is the area of Trapezium AFGH? 2
3. The centre Z of the figure will be the point of intersection of the diagonals of quadrilateral WXOP. Then what are the coordinates of Z? 1

KENDRIYA VIDYALAYA SANGATHAN,

FIRST PRE-BOARD EXAMINATION: 2024-2025

MATHEMATICS STANDARD (041)

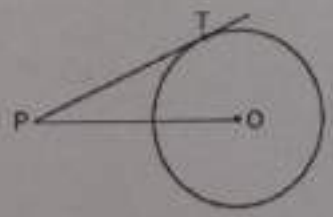
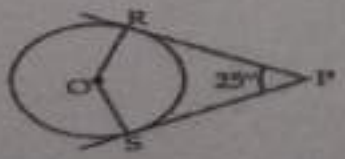
CLASS: X

Time Allowed: 3 Hrs.
Maximum Marks: 80

General Instructions:

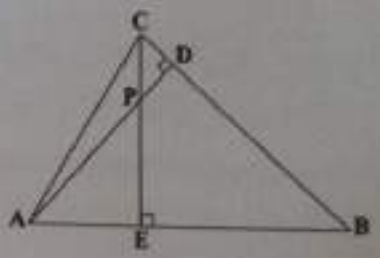
1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated

SECTION A		
Q. No.	**Section A consists of 20 questions of 1 mark each.**	**Marks**
1	If the zeroes of the quadratic polynomial $x^2 + (a + 1)x + b$ are 2 and -3, then (a) a = -7, b = -1 (b) a = 5, b = -1 (c) a = 2, b = -6 (d) a = 0, b = -6	1
2	The zeroes of the quadratic polynomial $x^2 + 9x + 18$ are (a) both positive (b) both negative (c) one positive and one negative (d) both equal	1
3	For what value k, do the equations $2x - y + 3 = 0$ and $6x - ky + 9 = 0$ represent coincident lines? (a) 2 (b) – 2 (c) 3 (d) -3	1
4	If the sum and product of the roots of the equation $3x^2 - 8x + 2k = 0$ are equal, then thevalue of k is (a) 4 (b) 3 (c) 6 (d) 8	1

5	If 2x, x + 10, 3x + 2 are in A.P., then x is equal to (a) 0 (b) 2 (c) 4 (d) 6	1
6	The coordinates of a point P, where PQ is the diameter of a circle whose centre is (2, – 3)and Q is (1, 4) is: (a) (3, -10) (b) (2, -10) (c) (-3, 10) (d) (-2, 10).	1
7	If the distance between the points A(2, -2) and B(-1, x) is equal to 5, then the value of x is: (a) 2 (b) -2 (c) 1 (d) -1	1
8	The value of $(\sin 30^\circ + \cos 30^\circ) - (\sin 60^\circ + \cos 60^\circ)$ is ..... (a) –1 (b) 0 (c) 1 (d) 2	1
9	If $3\sec\theta - 5 = 0$, then $\cot\theta$ is (a) $\frac{4}{5}$ (b) $\frac{5}{3}$ (c) $\frac{3}{4}$ (d) $\frac{3}{5}$	1
10	In the given below figure, point P is 26 cm away from the centre O of a circle and the length PT of the tangent drawn from P to the circle is 24 cm. Then the radius of the circle is (a) 25 cm (b) 26 cm (c) 24cm (d)10cm 	1
11	The tangents drawn at the extremities of the diameter of a circle are (a) Perpendicular (b) Parallel (c) equal (d) none of these	1
12	In the given figure, if ∠RPS = 25 °, the value of ∠ ROS is (a) 135° (b) 145° (c) 165° (d) 155° 	1
13	The ratio of the total surface area to the curved surface area of a cylinder with base radius 80cm and height 20 cm is (a) 1 : 2 (b) 2 : 1 (c) 3 : 1 (d) 5 : 1	1
14	Volume and total surface area of a solid hemisphere are numerically equal. What is the diameter of hemisphere? (a) 9 units (b) 6 units (c) 4.5 units (d) 18 units	1
15	If mean of a, a+3, a+6, a+9 and a+12 is 10, then a is equal to; (a) 1 (b) 2 (c) 3 (d) 4	1

16	Consider the following frequency distribution of the heights of 60 students of a class: Height (in cm) | 150 – 155 | 155 – 160 | 160 – 165 | 165 – 170 | 170 – 175 | 175 – 180 Number of students | 15 | 13 | 10 | 8 | 9 | 5 The sum of the lower limit of the modal class and upper limit of the median class is (a) 310 (b) 315 (c) 320 (d) 330	1
17	Cards are marked with numbers 1 to 50 are placed in the box and mixed thoroughly. One card is drawn at random from the box. What is the probability of getting a prime number? (a) 1 (b) $\frac{4}{10}$ (c) $\frac{1}{2}$ (d) $\frac{3}{10}$	1
18	A school has five houses A, B, C, D and E. One class has 23 students, 4 from house A, 8 from house B, 5 from house C, 2 from house D and the rest from house E. A single student is selected at random to be the class monitor. The probability that the selected student is not from houses A, B and C is: (a) $\frac{4}{23}$ (b) $\frac{6}{23}$ (c) $\frac{8}{23}$ (d) $\frac{17}{23}$	1
19	***DIRECTION:*** In the question number (19) and (20), a statement of assertion (A) is followed by a statement of Reason (R). ***Choose the correct option*** ***Statement A (Assertion)***: The HCF of two numbers is 15 and their product is 2250. Then their LCM is 150. ***Statement R(Reason)*** : If a, b are two positive integers, then HCF x LCM=a x b. (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A) (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A) (c) Assertion (A) is true but reason (R) is false. (d) Assertion (A) is false but reason (R) is true.	1

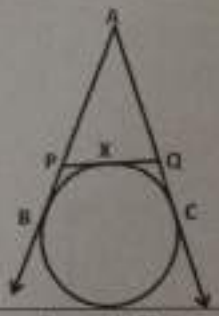
20	***Statement A (Assertion)***:If the perimeter of a circle is equal to that of a square, then the ratio of their areas is 14:11 ***Statement R (Reason)***: If the perimeter of a circle is equal to that of a square, then their areas are equal (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A) (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct **explanation** of assertion (A) (c) Assertion (A) is true but reason (R) is false. (d) Assertion (A) is false but reason (R) is true.	
	SECTION B	
	Section B consists of 5 questions of 2 marks each.	
21	Given that $\sqrt{3}$ is irrational, prove that $2 + 5\sqrt{3}$ is irrational. **(or)** Given that $\sqrt{7}$ is irrational, prove that $3\sqrt{7}$ is an irrational number.	2
22	Find the distance between the following pairs of points : (a, b), (– a, – b)	2
23	Find the ratio in which the y-axis divides the line segment joining the points (5, – 6) and (–1, – 4).	2
24	If $\tan(A + B) = \sqrt{3}$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$; $0° < A + B \leq 90°$; $A > B$, find A and B.	2
25	A bag contains 24 balls of which x are red, 2x are white and 3x are blue. Find x. A ball is selected at random. What is the probability that (i) it is red (ii) it is blue (iii) neither red nor blue **(or)** One card is drawn from a well-shuffled deck of 52 cards. Calculate the probability that the card will be (i) an ace, (ii) not be an ace.	2
	SECTION C	
	Section C consists of 6 questions of 3 marks each.	
26	Prove that $\sqrt{5}$ is an irrational number	3

	...e of the zero of the polynomial $3x^2 + 8x + 2k + 1$ is seven times the other, ...nd the value of 'k'.	3
28	Find the values of k for each of the following quadratic equations, so that they have two equal roots. (i) $2x^2 + kx + 3 = 0$ (ii) $kx(x-2) + 6 = 0$	3
29	Prove that $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta \operatorname{cosec}\theta$	3
30	Prove that " *If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio*" **(or)** In the given figure, altitudes AD and CE of Δ ABC intersect each other at the point P. Show that (i) Δ AEP ~ Δ CDP (ii) Δ ABD ~ Δ CBE (iii) Δ AEP ~ Δ ADB 	3
31	The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes. **(or)** An umbrella has 8 ribs which are equally spaced (see Fig.). Assuming umbrella to be a flat circle of radius 45 cm, find the area between the two consecutive ribs of the umbrella. 	3
	SECTION D	
	Section D consists of 4 questions of 5 mark each.	
32	A fraction becomes $\frac{9}{11}$ if 2 is added to both the numerator and the denominator. If 3 is added to both the numerator and the denominator, it becomes $\frac{5}{6}$. Find the fraction **(or)** A train covered a certain distance at a uniform speed. If the train would have been 10km/h faster, it would have taken 2 hours less than the scheduled time. And, if the train were slower by 10km/h, it would have taken 3 hours more than the scheduled time. Find the distance covered by the train.	5

33 Two poles of equal heights are standing opposite each other on either side of the road, which is 80 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30°, respectively. Find the height of the poles and the distances of the point from the poles.

34 Prove that the lengths of tangents drawn from an external point to a circle are equal. 5

Also If AB, AC, PQ are tangents in below figure and AB = 5 cm, find the perimeter of ΔAPQ



35 The mean of the following frequency table is 53. But the frequencies f1 and f2 in the classes 20–40 and 60–80 are missing. Find the missing frequencies 5

Age (in years)	0-20	20-40	40-60	60-80	80-100	Total
No. of people	15	f1	21	f2	17	100

(or)

The distribution given below shows the number of wickets taken by bowlers in one daycricket matches. Find the mean and median of the number of wickets taken.

No. of wickets	20-60	60-100	100-140	140-180	180-220	220-260
No. of bowlers	7	5	16	12	2	3

SECTION – E : CASE STUDY BASED QUESTIONS.

Section E consists of 3 questions of 4 mark each.

36 In a class the teacher asks every student to write an example of AP. Two boys Aryan and Roshan writes their progressions as -5,-2, 1,4 ..... and 187, 184, 181,..... respectively. Now the teacher asks the various students of the class the following questions on this progression. Help students to find the answers of the following.

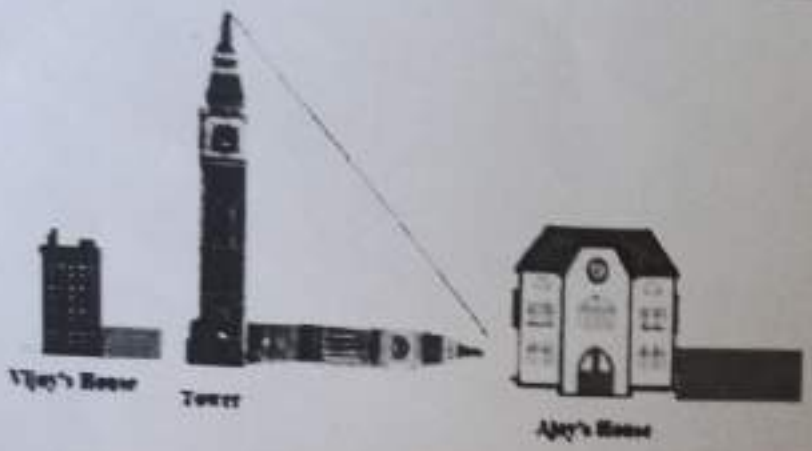
(i) Find the sum of common difference of the two progressions. 1

(ii) Find the 34th term of the progression written by Roshan. 1

(iii) Find the sum of first 10 terms of the progression written by Aryan. 2

(OR)

Which term of the two progressions will have the same value?



Vijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles.The height of Vijay's house if 20m when Vijay's house casts a shadow 10m long on the ground. At the same time, the tower casts a shadow 50m long on the ground and the house of Ajay casts 20m shadow on the ground.

(i) What is the height of the tower? 1

(ii) What is the height of Ajay's house? 1

(iii) What will be the length of the shadow of the tower when Vijay's house casts a shadow of 12m? 2

(or)

When the tower casts a shadow of 40m, same time what will be the length of the shadow of Vijay's house?

38 On a Sunday, your Parents took you to a fair. You could see lot of toys displayed, and you wanted them to buy a RUBIK's cube and strawberry ice-cream for you. Observe the figures and answer the questions-:

(i) Find the length of the diagonal if each edge measures 6cm ? 1

(ii)Find the volume of the solid figure if the length of the edge is 7cm? 1

(iii)What is the surface area of hemisphere (ice cream) if the base radius is 7cm? 2

(or)

If the slant height of the conical part is 5 cm, and its radius is 4 cm, find its height.

Evaluate :

1. $\lim_{x\to 3}\frac{x^2-9}{x-3}$
2. $\lim_{x\to \frac{1}{2}}\frac{4x^2-1}{2x-1}$
3. $\lim_{h\to 0}\frac{\sqrt{x+h}-\sqrt{x}}{h}$
4. $\lim_{x\to 0}\frac{(x+2)^{\frac{1}{3}}-2^{\frac{1}{3}}}{x}$
5. $\lim_{x\to 1}\frac{(1+x)^6-1}{(1+x)^2-1}$
6. $\lim_{x\to a}\frac{(2+x)^{\frac{5}{2}}-(a+2)^{\frac{5}{2}}}{x-a}$
7. $\lim_{x\to 1}\frac{x^4-\sqrt{x}}{\sqrt{x}-1}$
8. $\lim_{x\to 2}\frac{x^2-4}{\sqrt{3x-2}-\sqrt{x+2}}$
9. $\lim_{x\to\sqrt{2}}\frac{x^4-4}{x^2+3\sqrt{2}x-8}$
10. $\lim_{x\to 1}\frac{x^7-2x^5+1}{x^3-3x^2+2}$
11. $\lim_{x\to 0}\frac{\sqrt{1+x^3}-\sqrt{1-x^3}}{x^2}$
12. $\lim_{x\to -3}\frac{x^3+27}{x^5+243}$
13. $\lim_{x\to \frac{1}{2}}\left(\frac{8x-3}{2x-1}-\frac{4x^2+1}{4x^2-1}\right)$
14. Find 'n', if $\lim_{x\to 2}\frac{x^n-2^n}{x-2}=80$, $n\in \mathbf{N}$
15. $\lim_{x\to a}\frac{\sin 3x}{\sin 7x}$
16. $\lim_{x\to 0}\frac{\sin^2 2x}{\sin^2 4x}$
17. $\lim_{x\to 0}\frac{1-\cos 2x}{x^2}$
18. $\lim_{x\to 0}\frac{2\sin x-\sin 2x}{x^3}$
19. $\lim_{x\to 0}\frac{1-\cos mx}{1-\cos nx}$
20. $\lim_{x\to \frac{\pi}{3}}\frac{\sqrt{1-\cos 6x}}{\sqrt{2}\left(\frac{\pi}{3}-x\right)}$
21. $\lim_{x\to \frac{\pi}{4}}\frac{\sin x-\cos x}{x-\frac{\pi}{4}}$
22. $\lim_{x\to \frac{\pi}{6}}\frac{\sqrt{3}\sin x-\cos x}{x-\frac{\pi}{6}}$
23. $\lim_{x\to 0}\frac{\sin 2x+3x}{2x+\tan 3x}$
24. $\lim_{x\to a}\frac{\sin x-\sin a}{\sqrt{x}-\sqrt{a}}$
25. $\lim_{x\to \frac{\pi}{6}}\frac{\cot^2 x-3}{\operatorname{cosec} x-2}$
26. $\lim_{x\to 0}\frac{\sqrt{2}-\sqrt{1+\cos x}}{\sin^2 x}$
27. $\lim_{x\to 0}\frac{\sin x-2\sin 3x+\sin 5x}{x}$
28. If $\lim_{x\to 1}\frac{x^4-1}{x-1}=\lim_{x\to k}\frac{x^3-k^3}{x^2-k^2}$, then find the value of k.

KENDRIYA VIDYALAYA DRDO, BENGALURU-93
WINTER BREAK HHW
CLASS-XII

General Instructions:

1. This Question paper contains **five sections** A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. **Section A** has 18 **MCQ's and 02** Assertion-Reason based questions of 1mark each.
3. **Section B** has 5 **Very Short Answer (VSA)-type** questions of 2marks each.
4. **Section C** has 6 **Short Answer (SA)-type** questions of 3marks each.
5. **Section D** has 4 **Long Answer (LA)-type** questions of 5marks each.
6. **Section E** has 3 **source based/case based/passage based/integrated units of assessment** (4marks each) with sub-parts.

SECTION A
(Multiple Choice Questions)
Each question carries 1mark

1). Sum of the order and degree of the differential equation $\left(x + \frac{dy}{dx}\right)^2 = \left(\frac{dy}{dx}\right)^2 + 1$ is

(a) 1 (b) 2 (c) 3 (d) 4

2). The corner points of the feasible region determined by the system of linear constraints are (0,3), (1,1) and (3,0). Let Z = px + qy, where p, q > 0. Condition on p and q so that the minimum of Z occurs at both the points (3,0) and (1,1) is

(a) 2p = q (b) p = 2q (c) q = p (d) q = 3p

3). If A is a square matrix such that $A^2 = A$, then the value of $7A - (I+A)^3$, where I is an identity matrix, is

(a) – I (b) I (c) A (d) A – I

4). The general solution of the differential equation $\frac{dy}{dx} = \frac{y}{x}$, is

(a) log y = kx (b) xy = k (c) y = kx (d) y = k log x

5). The region represented by the inequation system $x, y \geq 0, y \leq 6, x + y \leq 3$ is

(a) unbounded in the first quadrant (b) unbounded in first and second quadrants
(c) bounded in first quadrant containing the origin
(d) bounded in first quadrant not containing the origin

6). A problem in mathematics is given to three students whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ respectively. If the event of their solving the problem are independent, then the probability that the problem will be solved, is

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{3}{4}$

7). If the area of the triangle with vertices (-3,0) ,(3,0) and (0,k) is 9 sq units, then the value(s) of k will be
(a) ± 9 (b) ± 3 (c) ± 8 (d) ± 4

8). Let A be a 3×3 matrix such that $|adj\ A| = 64$. Then $|A|$ is equal to
(a) 8 only (b) -8 only (c) 64 (d) 8 or -8

9). If $A = \begin{bmatrix} 3 & 4 \\ 5 & 2 \end{bmatrix}$ and 2A + B is a null matrix, then B is equal to

(a) $\begin{bmatrix} 6 & 8 \\ 10 & 4 \end{bmatrix}$ (b) $\begin{bmatrix} -6 & -8 \\ -10 & -4 \end{bmatrix}$ (c) $\begin{bmatrix} 3 & 4 \\ 5 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} -3 & -4 \\ -5 & -2 \end{bmatrix}$

10). If $\begin{bmatrix} 2 & 0 \\ 5 & 4 \end{bmatrix} = P + Q$, where P is a symmetric and Q is a skew symmetric matrix, then Q is equal to

(a) $\begin{bmatrix} 0 & \frac{-5}{2} \\ \frac{5}{2} & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & \frac{5}{2} \\ \frac{-5}{2} & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & \frac{-5}{2} \\ \frac{5}{2} & 4 \end{bmatrix}$ (d) $\begin{bmatrix} 2 & \frac{5}{2} \\ \frac{5}{2} & 4 \end{bmatrix}$

11). If f(x) is continuous at x=1 and $f(x) = \begin{cases} 4x^2 + 3bx, & x \neq 1 \\ 5x - 4, & x = 1 \end{cases}$ then the value of 'b' is
(a) 3 (b) - 1 (c) 1 (d) - 3

12). If $y = e^{-x}$, then $\frac{d^2y}{dx^2}$ is equal to
(a) y (b) - y (c) x (d) – x.

13). If $\frac{d}{dx}[f(x)] = ax + b$ and $f(0) = 0$, then f(x) is equal to
(a) a + b (b) b (c) $\frac{ax^2}{2} + bx$ (d) $\frac{ax^2}{2} + bx + c$

14). If $\vec{a}$ and $\vec{b}$ are such that $|\vec{a}.\vec{b}| = |\vec{a} \times \vec{b}|$, then the angle between $\vec{a}$ and $\vec{b}$ is
(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{2}$

15). In a triangle OAC, if B is the midpoint of side AC and $\overrightarrow{OA} = \vec{a}$, $\overrightarrow{OB} = \vec{b}$, then $\overrightarrow{OC}$ is equal to
(a) $\vec{a} + \vec{b}$ (b) $\frac{\vec{a}+\vec{b}}{2}$ (c) $2\vec{a} + \vec{b}$ (d) $2\vec{b} - \vec{a}$

16). The value of $(\hat{i} \times \hat{j}).\hat{k} + \hat{i}.\hat{j}$
(a) - 1 (b) 0 (c) 2 (d) 1

17). The two lines $\vec{r} = (\hat{i} + \hat{j} - \hat{k}) + \mu(2\hat{i} + 3\hat{j} - 6\hat{k})$ and $\vec{r} = (2\hat{i} - \hat{j} - \hat{k}) + \alpha(6\hat{i} + 9\hat{j} - 18\hat{k})$ are
(a) parallel (b) intersecting (c) perpendicular (d) skew

18). The direction cosines of a vector equally inclined to the axes OX, OY and OZ are
(a) (1,1,1) (b) $\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ (c) $\left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$ (d) (1,2,3)

12 mark

ASSERTION-REASON BASED QUESTIONS:

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

19). Assertion (A) : Let A = {2,4,6} and B = {3,5,7,9} and defined a function f = {(2,3),(4,5),(6,7)} from A to B. Then, f is not onto.

Reason(R): A function f : A → B is onto, if every element of B is the image of some element of A under f.

20). Assertion (A) : If f(x) = log(sin x), x > 0 is strictly decreasing in $\left(\pi, \frac{3\pi}{2}\right)$

Reason(R): If $f'(x) > 0$, then f(x) is strictly increasing function.

SECTION B

This section comprises of very short answer type-questions (VSA) of 2marks each

21). Find the principal value of $\tan^{-1}(\sqrt{3}) - \cot^{-1}(-\sqrt{3})$.

(OR)

Find the range of the function $f(x) = 2\sin^{-1} x + \frac{3\pi}{2}$

22). The total revenue in rupees received from the sale of 'x' units of a product is given by $R(x) = 13x^2 + 26x + 15$. Find the marginal revenue when x = 7.

23). Find the interval(s) in which the function f : R → R defined by $f(x) = x^2 e^{-x}$, is increasing

24). If $f(x) = 9x^2 + 12x + 2$, then find the minimum value of f(x).

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Find the maximum profit that a company can make, if the profit function is given by $P(x) = 72 + 42x - x^2$, where x is the number of units and P is the profit in rupees.

25). Evaluate :

$$\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} (x^3 + x\cos x + \tan^5 x)\, dx$$

SECTION C

This section comprises of Short Answer type questions (SA) of 3marks each

26). If x = a (cos t + t sin t) and y = a (sin t − t cos t), $0 < t < \frac{\pi}{2}$, find $\frac{d^2y}{dx^2}$.

27). Evaluate : $\int_0^{2\pi} \frac{1}{1+e^{\sin x}}\, dx$.

(OR)

Evaluate : $\int_0^{\frac{\pi}{4}} \log(1 + \tan x)\, dx$.

12 mat

28). Evaluate : $\int \frac{6x+7}{\sqrt{(x-5)(x-4)}}\,dx$.

29). Solve the differential equation $\frac{dx}{dy} + x\cot y = 2y + y^2 \cot y$ where $y \neq 0$

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Solve the differential equation $\left[x\,sin^2\left(\frac{y}{x}\right) - y\right] dx + x\,dy = 0$

30) Solve the following linear programming problem graphically.

Minimize $Z = 3x + 9y$

Subject to

$x + 3y \leq 60$, $x + y \geq 10$, $x \leq y$, $x, y \geq 0$

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Solve the following linear programming problem graphically.

Minimize $Z = 50x + 70y$

Subject to

$2x + y \geq 8$, $x + 2y \geq 10$, $x, y \geq 0$

31). A random variable X has the following probability distribution, where k is some real number

X	0	1	2	otherwise
P(X)	k	2k	3k	0

(1) Determine the value of k

(2) Find P(X<2)

(3) Find P(X>2)

SECTION D

This section comprises of Long Answer-type questions (LA) of 5 marks each

32). Prove that the relation R on the set N×N defined by (a,b) R (c,d) ⇒ a + d = b + c, for every (a,b), (c,d) $\in N \times N$ is an equivalence relation.

(OR)

If R_1 *and* R_2 are equivalence relations in a set A , show that $R_1 \cap R_2$ is also an equivalence relation.

33). Find the area of the smaller region bounded by the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ and the line $\frac{x}{3} + \frac{y}{2} = 1$

34). Using matrix method, solve

$$\frac{2}{x}+\frac{3}{y}+\frac{10}{z}=4,\ \frac{4}{x}-\frac{6}{y}+\frac{5}{z}=1,\ \frac{6}{x}+\frac{9}{y}-\frac{20}{z}=2$$

35). Find the coordinates of the image of the point P(0,2,3) with respect to the line $\frac{x+3}{5}=\frac{y-1}{2}=\frac{z+4}{3}$

(OR)

Find the shortest distance between the lines whose equations are

$\vec{r_1}=\hat{\imath}+\hat{\jmath}+\lambda(2\hat{\imath}-\hat{\jmath}+\hat{k})$ and $\vec{r_2}=2\hat{\imath}+\hat{\jmath}-\hat{k}+\mu(3\hat{\imath}-5\hat{\jmath}+2\hat{k})$

SECTION E

This section comprises of 3 case-study/passage-based questions of 4 marks each. First two questions have three sub-parts (1),(2),(3) of marks 1,1,2 respectively. The third case study question has two sub-parts of 2 marks each.

36). Read the following passage and answer the questions given below.

A house is being constructed and a lot of planning is put into it. Now a person is confused about the window. He wants the window in the form of a rectangle surmounted by a semicircle such that the perimeter of the window is to be 10 metres. If radius of the semicircular portion is 'r' metres and height of the rectangular portion is 'x' metres, then

(1) Write a relation between x and r.
(2) Represent the area in terms of 'r'.
(3) Find the critical point, with respect to area, in terms of 'r'.

(OR)

(3) What are dimensions so that maximum light may enter the room?

(Note: Internal choice is for option 3)

12 mk

37). A student of class XII wants to find the displacement of an object using the formula $\vec{s} = \vec{u}t + \frac{1}{2}\vec{a}\,t^2$ and $\vec{a} = \frac{\vec{F}}{m}$, *where* $\vec{u} = 2\hat{\imath}\ m/s$ and mass of the object is 2 kg. Force on the object are as (Newton unit)

$\overrightarrow{F_1} = 2\hat{\imath} + 3\hat{\jmath} - \hat{k}$, $\overrightarrow{F_2} = 2\hat{\imath} + 2\hat{\jmath} - 3\hat{k}$

From the above information answer the following

(1) Find the net force on the object.

(2) Find the acceleration of the object.

(3) Find the unit vector perpendicular to both $\overrightarrow{F_1}$ and $\overrightarrow{F_2}$.

(OR)

(3) Find the displacement in 2 seconds.

(Note: Internal choice is for option 3)

38). A company has two plants to manufacture TVs. The first plant manufactures 70% of the TVs and the rest are manufactured by the second plant. 80% of the TVs manufactured by the first plant are rated of standard quality, while that of the second plant only 60% are of standard quality. One TV is selected at random.

Based on the above information answer the following :

(i) Find the probability that the selected TV is of standard quality.

(ii) Find the probability that the TV is of standard quality, given that it was manufactured by the first plant.

****

Evaluate :

1. $\lim_{x\to 3}\frac{x^2-9}{x-3}$
2. $\lim_{x\to \frac{1}{2}}\frac{4x^2-1}{2x-1}$
3. $\lim_{h\to 0}\frac{\sqrt{x+h}-\sqrt{x}}{h}$
4. $\lim_{x\to 0}\frac{(x+2)^{\frac{1}{3}}-2^{\frac{1}{3}}}{x}$
5. $\lim_{x\to 1}\frac{(1+x)^6-1}{(1+x)^2-1}$
6. $\lim_{x\to a}\frac{(2+x)^{\frac{1}{2}}-(a+2)^{\frac{1}{2}}}{x-a}$
7. $\lim_{x\to 1}\frac{x^4-\sqrt{x}}{\sqrt{x}-1}$
8. $\lim_{x\to 2}\frac{x^2-4}{\sqrt{3x-2}-\sqrt{x+2}}$
9. $\lim_{x\to 2}\frac{x^4-4}{x^2+3\sqrt{2x-8}}$
10. $\lim_{x\to 1}\frac{x^7-2x^5+1}{x^3-3x^2+2}$
11. $\lim_{x\to 0}\frac{\sqrt{1+x^3}-\sqrt{1-x^3}}{x^2}$
12. $\lim_{x\to -1}\frac{x^3+27}{x^5+243}$
13. $\lim_{x\to \frac{1}{2}}\left(\frac{8x-3}{2x-1}-\frac{4x^2+1}{4x^2-1}\right)$
14. Find 'n', if $\lim_{x\to 2}\frac{x^n-2^n}{x-2}=80$, $n\in \mathbf{N}$
15. $\lim_{x\to \pi}\frac{\sin 3x}{\sin 7x}$
16. $\lim_{x\to 0}\frac{\sin^2 2x}{\sin^2 4x}$
17. $\lim_{x\to 0}\frac{1-\cos 2x}{x^2}$
18. $\lim_{x\to 0}\frac{2\sin x-\sin 2x}{x^3}$
19. $\lim_{x\to 0}\frac{1-\cos mx}{1-\cos nx}$
20. $\lim_{x\to \frac{\pi}{3}}\frac{\sqrt{1-\cos 6x}}{\sqrt{2}\left(\frac{\pi}{3}-x\right)}$
21. $\lim_{x\to \frac{\pi}{4}}\frac{\sin x-\cos x}{x-\frac{\pi}{4}}$
22. $\lim_{x\to \frac{\pi}{6}}\frac{\sqrt{3}\sin x-\cos x}{x-\frac{\pi}{6}}$
23. $\lim_{x\to 0}\frac{\sin 2x+3x}{2x+\tan 3x}$
24. $\lim_{x\to a}\frac{\sin x-\sin a}{\sqrt{x}-\sqrt{a}}$
25. $\lim_{x\to \frac{\pi}{6}}\frac{\cot^2 x-3}{\operatorname{cosec} x-2}$
26. $\lim_{x\to 0}\frac{\sqrt{2}-\sqrt{1+\cos x}}{\sin^2 x}$
27. $\lim_{x\to 0}\frac{\sin x-2\sin 3x+\sin 5x}{x}$
28. If $\lim_{x\to 1}\frac{x^4-1}{x-1}=\lim_{x\to k}\frac{x^3-k^3}{x^2-k^2}$, then find the value of k.

KENDRIYA VIDYALAYA DRDO, BENGALURU-93
WINTER BREAK HHW
CLASS-XII

General Instructions:

1. This Question paper contains **five sections** A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. **Section A** has 18 **MCQ's and 02** Assertion-Reason based questions of 1mark each.
3. **Section B** has 5 **Very Short Answer (VSA)-type** questions of 2marks each.
4. **Section C** has 6 **Short Answer (SA)-type** questions of 3marks each.
5. **Section D** has 4 **Long Answer (LA)-type** questions of 5marks each.
6. **Section E** has 3 **source based/case based/passage based/integrated units of assessment** (4marks each) with sub-parts.

SECTION A
(Multiple Choice Questions)
Each question carries 1mark

1). Sum of the order and degree of the differential equation $\left(x + \frac{dy}{dx}\right)^2 = \left(\frac{dy}{dx}\right)^2 + 1$ is

(a) 1 (b) 2 (c) 3 (d) 4

2). The corner points of the feasible region determined by the system of linear constraints are (0,3), (1,1) and (3,0). Let Z = px + qy, where p, q > 0. Condition on p and q so that the minimum of Z occurs at both the points (3,0) and (1,1) is

(a) 2p = q (b) p = 2q (c) q = p (d) q = 3p

3). If A is a square matrix such that $A^2 = A$, then the value of $7A - (I+A)^3$, where I is an identity matrix, is

(a) – I (b) I (c) A (d) A – I

4). The general solution of the differential equation $\frac{dy}{dx} = \frac{y}{x}$, is

(a) log y = kx (b) xy = k (c) y = kx (d) y = k log x

5). The region represented by the inequation system $x, y \geq 0, y \leq 6, x + y \leq 3$ is

(a) unbounded in the first quadrant (b) unbounded in first and second quadrants
(c) bounded in first quadrant containing the origin
(d) bounded in first quadrant not containing the origin

6). A problem in mathematics is given to three students whose chances of solving it are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ respectively. If the event of their solving the problem are independent, then the probability that the problem will be solved, is

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{3}{4}$

7). If the area of the triangle with vertices (-3,0) ,(3,0) and (0,k) is 9 sq units, then the value(s) of k will be
(a) ± 9 (b) ± 3 (c) ± 8 (d) ± 4

8). Let A be a 3×3 matrix such that $|adj\ A| = 64$. Then $|A|$ is equal to
(a) 8 only (b) -8 only (c) 64 (d) 8 or -8

9). If $A = \begin{bmatrix} 3 & 4 \\ 5 & 2 \end{bmatrix}$ and 2A + B is a null matrix, then B is equal to

(a) $\begin{bmatrix} 6 & 8 \\ 10 & 4 \end{bmatrix}$ (b) $\begin{bmatrix} -6 & -8 \\ -10 & -4 \end{bmatrix}$ (c) $\begin{bmatrix} 3 & 4 \\ 5 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} -3 & -4 \\ -5 & -2 \end{bmatrix}$

10). If $\begin{bmatrix} 2 & 0 \\ 5 & 4 \end{bmatrix} = P + Q$, where P is a symmetric and Q is a skew symmetric matrix, then Q is equal to

(a) $\begin{bmatrix} 0 & \frac{-5}{2} \\ \frac{5}{2} & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & \frac{5}{2} \\ \frac{-5}{2} & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & \frac{-5}{2} \\ \frac{5}{2} & 4 \end{bmatrix}$ (d) $\begin{bmatrix} 2 & \frac{5}{2} \\ \frac{5}{2} & 4 \end{bmatrix}$

11). If f(x) is continuous at x=1 and $f(x) = \begin{cases} 4x^2 + 3bx, & x \neq 1 \\ 5x - 4, & x = 1 \end{cases}$ then the value of 'b' is
(a) 3 (b) - 1 (c) 1 (d) - 3

12). If $y = e^{-x}$, then $\frac{d^2y}{dx^2}$ is equal to
(a) y (b) - y (c) x (d) – x.

13). If $\frac{d}{dx}[f(x)] = ax + b$ and $f(0) = 0$, then f(x) is equal to
(a) a + b (b) b (c) $\frac{ax^2}{2} + bx$ (d) $\frac{ax^2}{2} + bx + c$

14). If $\vec{a}$ and $\vec{b}$ are such that $|\vec{a}.\vec{b}| = |\vec{a} \times \vec{b}|$, then the angle between $\vec{a}$ and $\vec{b}$ is
(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{2}$

15). In a triangle OAC, if B is the midpoint of side AC and $\overrightarrow{OA} = \vec{a}$, $\overrightarrow{OB} = \vec{b}$, then $\overrightarrow{OC}$ is equal to
(a) $\vec{a} + \vec{b}$ (b) $\frac{\vec{a}+\vec{b}}{2}$ (c) $2\vec{a} + \vec{b}$ (d) $2\vec{b} - \vec{a}$

16). The value of $(\hat{i} \times \hat{j}).\hat{k} + \hat{i}.\hat{j}$
(a) - 1 (b) 0 (c) 2 (d) 1

17). The two lines $\vec{r} = (\hat{i} + \hat{j} - \hat{k}) + \mu(2\hat{i} + 3\hat{j} - 6\hat{k})$ and $\vec{r} = (2\hat{i} - \hat{j} - \hat{k}) + \alpha(6\hat{i} + 9\hat{j} - 18\hat{k})$ are
(a) parallel (b) intersecting (c) perpendicular (d) skew

18). The direction cosines of a vector equally inclined to the axes OX, OY and OZ are
(a) (1,1,1) (b) $\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ (c) $\left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3}\right)$ (d) (1,2,3)

12 mark

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In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

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This section comprises of very short answer type-questions (VSA) of 2marks each

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(OR)

Find the range of the function $f(x) = 2\sin^{-1} x + \frac{3\pi}{2}$

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Minimize $Z = 3x + 9y$

Subject to

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(1) Determine the value of k

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This section comprises of Long Answer-type questions (LA) of 5 marks each

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SECTION E

This section comprises of 3 case-study/passage-based questions of 4 marks each. First two questions have three sub-parts (1),(2),(3) of marks 1,1,2 respectively. The third case study question has two sub-parts of 2 marks each.

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(1) Write a relation between x and r.
(2) Represent the area in terms of 'r'.
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(OR)

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12 mk

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$\overrightarrow{F_1} = 2\hat{\imath} + 3\hat{\jmath} - \hat{k}$, $\overrightarrow{F_2} = 2\hat{\imath} + 2\hat{\jmath} - 3\hat{k}$

From the above information answer the following

(1) Find the net force on the object.

(2) Find the acceleration of the object.

(3) Find the unit vector perpendicular to both $\overrightarrow{F_1}$ and $\overrightarrow{F_2}$.

(OR)

(3) Find the displacement in 2 seconds.

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Based on the above information answer the following :

(i) Find the probability that the selected TV is of standard quality.

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